Popular Science

FOUNDED MONTHILY 1872

INVENTIONS
DISCOVERIES
RADIO
AUTOMOBILES
AVIATION
HOME WORKSHOP



JANUARY

How to make the new and thrilling winged toboggan. Page 72

25 CENTS

Inventions I Hope to Make—Edison

was a state of the state of

No matter what set you buy, be sure the dealer puts in genuine Radiotrons:

| UV-199 | \$2.50 |
|-----------|--------|
| UX-199 | \$2.50 |
| UX-120 | \$2.50 |
| LIV-201-A | \$2.50 |
| UX-201-A | \$2.50 |
| UV-200 | \$2.50 |
| UX-200 | \$2.50 |
| WD-11 | \$2.50 |
| WD-12 | \$2.50 |
| WX-12 | \$2.50 |
| UX-112 | \$6.50 |
| UX-210 | 99.00 |

Rectrons:

UX-213 \$7.00 UX-216-B \$7.50

A"UX" or "WX"
tube is the same at
the corresponding
"UV" or "WD"
tube, except in the
design of the law,





Radiotron UV-201-A, standard highvacuum tube for worage battery sets.

for every Christmas Radio Set use only genuine RCA Radiotrons

READ all the claims of all the makers of radio sets—and then remember this when you buy—that getting what is claimed for a set depends upon the quality of the vacuum tube put into it. You cannot get clearness—you cannot get distance—you cannot get volume—unless the tubes get it. That is why it is so important to look at the base of every tube, to be sure it is a genuine RCA Radiotron.

A great gift for any fan_at \$2.50

A radio fan will appreciate a "spare" Radiotron, just as an autoist appreciates a spare tire. But the Radiotron—a genuine RCA Radiotron—costs only \$2.50. If you note what make of set a man owns, any dealer can tell you which type of Radiotron he uses, and you can give him exactly what he would choose for himself.

for owners of Super-Heterodynes — the new power tube

Every owner of a Radiola Super-Heterodyne can bring his set right up-to-date with the latest improvement, if you give him the new dry battery power Radiotron UX-120, and the adapter. The adapter costs but \$1.50. And this new tube means great volume with better tone than ever!

> RADIO CORPORATION OF AMERICA CHICAGO NEW YORK SAN FRANCISCO

RCA-Radiotron

MADE BY THE MAKERS OF RADIOLAS

How Kolster Reveals RADIO'S

"LOST CHORDS"

Subtle overtones now developed. A won-drous achievement in tonal perfection

Reproduction such as you've never heard before.

The climax in reception, the ideal in reproduction.

Your ear will instantly detect Kolster superiority.

You'll recognize a broader range of notes, all the delicate shadings and individuality.

If Zimbalist plays, it is Zimbalist—as if you were actually in the studio. There is no interference, no muffling, no exaggerations or repressions.

If the President makes a speech, if McCormack sings, if Lopez jazzes, if Godowsky plays the piano—

-whoever or whatever is broadcast in reproduced faithfully.

A Kolster neither adds to nor subtracts from broadcasting.

So now comes new reality. All the rich tonal coloring in its natural beauty—not mere sound but vivid, lifelike.

And all with simplicity. Just turn from one station to another. The Kolster has a single control. No "tricky" tuning with numerous dials. No chart of strange numbers.

Free from interference, No howls, No background noises. No overlapping of stations.

In short, the radio you've expected. The refinements you've wanted. Radio at its best.

To hear a Kolster gives a new thrill. It sets new standards.

Hear the Kolster in your own home or at a Kolster dealer's shop. Five beautiful models. De luxe, but not expensive.

FEDERAL TELEGRAPH COMPANY
(of California)
Woolworth Building, New York City



Model 6-C is a six tube, antenna, set, loud speaker enclosed, ample space for receiver and all batteries.

A Parade of Stations

One station after another parades by as you turn the Kolster regulator.

Whatever is on the air comes in easily, perfectly.

0

KOLSTER RADIO

Popular Science Monthly The Magazine of Invention and Discovery

JANUARY, 1926; Vol. 108, No. 1 25 cents a Copy; \$2.50 a Year



Published in New York City at 250 Fourth Avenue

Features in This Issue

LL outdoors is the studio of Remington Schuyler, the noted American Indian painter; but nowhere, we think you will agree, has he portrayed the tingling thrill of winter more masterfully than in the painting on the cover of this issue. If this picture makes you want to build a winged toboggan and try it on the negreet hill, your enthusiasm will be doubled when you read the graphic description of this fascinating new winter sport by its originator. Turn to page 72.

THETHER clothes make V the man or not, it is fairly certain that spotted and shabby clothes never get a man very far. For every one who values the measure of self-respect to be drawn from a neat appearance, the article by an expert dry cleaner on page 23 holds a wealth of useful information on a little understood subject.



The autogire, amazing fiying machine, that flaps its wings like a bird, described on page 13 of this issue

FTER all that has been said and A written about memory and how to improve it, a Columbia University professor at last has really hit the nail on the head on page 26 of this issue. He offers us no short cut to perfect memory. Instead he shows

us how we can manage more efficiently the marvelous filing system of our minds and so increase its working capacity.

Professor Robert S. Woodworth also cites interesting instances of men who have naturally remarkable memories.

HAVE you been caught by the hard coal shortage? There's a sure way to beat the problem, as you will learn when you turn to the article on page 34.

It tells you just how you can burn soft coal in your furnace almost, if not quite, as effectively as anthracite.

THAT often - dreamed - of achievement-vertical flight from the roofs of buildings and homes-may be brought a step nearer reality by the remarkable flying machine, the autogizo, pictured here. On page 13 you will read of its remarkable test flight.

And 200 Other Articles and Pictures, including-

| A Company of the comp | |
|--|------|
| Popular Science Institute of Standards | |
| Why Curlouity Pays | 9 |
| By Thomas L. Marron | |
| The Invisible Lifetine of the Sea | - 53 |
| By Peter Vischer | |
| Flaps Its Wings like a Bird | 1.3 |
| By Arthur A. Stuart | |
| Inventions Edison Still Hopes to Make | 34 |
| By John R. McMahan | |
| Lexions in Moule | 16 |
| By Houding | |
| Is This the Face of Future Man! | _10 |
| By Ernest Breunecke, fr. | |
| South American Snake Farm. | 20 |
| By Francis Com-Smith | |
| Cariastics in Sport | _22 |
| What a Cleaner Has Learned | 3. |
| By Walson G. Clark | |
| The 1978 Eclipse | 13 |
| By Newton Burke | |
| In Your Memory Badly Managed? | 26 |
| By Robert S. Woodwarth, Ph.D. | |
| When Trains Crash | 38 |
| By Truman Stevens | |
| Prize-Winners in the August Contest | 31 |
| Where Old Houses Gg. | _11 |
| When Burning Soft Coal | 34 |
| Tracking the Killer by His Bullets | 16 |
| | |

| Mechanical Farm Hand Make Cons. | 31 |
|--|------|
| Paper Sourds and Buses from Waste | - 58 |
| Soys Build Scenic Railway | 33 |
| American Home Stapped to France | 39 |
| Auto Carries Wire Cutter | 45 |
| Taking a Sawmill into the Forest | 41 |
| Know Your Caz | - 41 |
| Pawder Puff Can Be Changed Easily | -41 |
| "Vacuum Cleaner" Unhurds Carroer. | 41 |
| Oddities on Wheels. | -67 |
| Queer Boats and Their Skippers | 43 |
| Barls Has Moving Sidewalks | -91 |
| Fresh Coffee for Every Customer | -16 |
| Free Pound Motion Picture Ontid | -44 |
| Reflectors Teach have to Druw | -43 |
| Styles in Industrial Gas Masks | -13 |
| Science Is Putting New Ideas to Use Unasual Products of Handwritt | - 66 |
| Cousseal Products of Handicraft | 43 |
| Have You Seen Them Any Bigger? | -35 |
| Camp Fire Girl Made of Butter | -54 |
| Lighthouse Is a Radio Set | .54 |
| Where Roots Are Day for Pipes | -35 |
| Cycle Car from Airplane Parts | 20 |
| Four Sottles Suggest an Elephant | - |
| Triveling Dolls Teach First Ald | 3. |
| Radio Set Made into a Book | 5 |
| Newest Marvels of Aviation | - |
| He Fries Eggs on Ice | 30 |
| | |

| W-1 W-10 CA W 1977 | Page |
|---|--------------|
| Boat Guided by Beam of Light | 34 |
| Automatic Music Turner | 54 |
| Feet Teleggam a Novel Sport | 54 |
| He Invents New Golf Game | . 35 |
| Re Invents New Golf Game Embossing Machine Aids Blind Printers | . 55 |
| Canvas Late Cathers Proit | 35 |
| Traffic Cop a Semaphore 16 Answers to Housewives Problems | . 35 |
| 16 Answers to Housewives Problems | 56 |
| Cours Sorted and Country Automatically | 58 |
| Cittar Clints Lies Flat | . 58 . 58 |
| Rod Holder for Lazy Fishermen | . 38 |
| Pencel Writes in Five Different Colors | . 39 |
| Measuring Wear on Transets | 59 |
| Charcoal Gas Substitute for Casoline | . 59 |
| A Loudspeaker Von Can Rolld | . 60 |
| By Alfred P. Lane | |
| Unusual Hook-Ups and Ideas in Radio | - 62 |
| What 10,000,000 People Lake to Hear | . 03 |
| New Auto Fittings | . 65 |
| How to Paint Your Car | - 66 |
| By Martin Bunn | |
| Useful Hims for Car Owners. | . 68 |
| | |
| Home Workshop | |
| Patter Chan Mathada 70 | |
| Better Shop Methods76 | |
| | |

And Other Timely Articles and Pictures

Carry tini Historia

POPULAR SCIENCE MONTHLY

Issued monthly. Single copy, 24 cents. Yearly subscription to United States. Its possessions, and Canada, \$3.50; foreign countries. \$3. Enteredian second-class matter Dec. 28, 1918, at the Part Office at New York under the act of March 3, 1979; additional entry as second-class matter at Dunesten, N. J. Entered as second-class matter at Dunesten, N. J. Entered as second-class matter at the Popt Office Department, Canada, Printed in U. S. A. Copyright 1925, by the Popolar Science Publishing Co. Inc. The equipment of

this magazine must not be reprinted without permission. In presenting in the editorial columns numerous stories of new products of applied science. Portulas Science Mastraly does not underwrite the turstness medicule of the individuals or concerns producing them. The use of Portulas Science Mastraly articles, or qualitions from them for stock-selling schemes is never authorized. O. B. Capes. President and Treasurer. H. C. Wilson, Vice-President: A. L. Cole, Scoretzer

Brandes

EXPERTS IN RADIO ACOUSTICS SINCE 1908



The Brandes Cone a truly decorative bit of furniture that conceals a remarkable speaker,





The Brandes Cabinet of mahogany, finished in walnut brown. The same unit, quality of tone and evengreater volume than the Type H Speaker.



The Adjustable
Table-Talker.
Gooseneck horn.
Finished in brown
felt-padded base.
Adjustable. A most
entisfactory buy,



The Superior Matched Tone Headset is now, as always, ideal to tune in with—to listen undisturbed and undisturbing. Offered at a new low price.



The Audio Transformeramplifies at an unumually high ratio—1 to 5. Two steps of amplification may be used without transformer distortion.

Send for an interesting booklet describing Acoustics by Brandes. Brandes Products Corp. 200 Mt. Pleasant Ave. Newark, N. I.



The Phonograph Attachment—a splendid speaker with any good phonograph. Same unit as Type H horn. Adjustable and furnished with a connection to fit all phonographs,

The new Brandes speakers perfected now after many bury years of experiment — give new clarified mellowness to the low tones, new rounded sweetness to the high.

Be sure your set is in its best voice-always-with acoustics by Brandes.

0

O Copyrighted by Brandes Products Corp. -- 3406

Are You Looking for

OPPORTUNITY? Turn to Pages 120 to 150

You'll find in our new section "Money-Making Opportunities" just the Opportunity you seek!

Are you dissatisfied with your job, your salary, your future?
Do you envy those who are better paid than you?

There's just one sure way to get ahead, to climb out of the small pay rut—and that way is through Training. And there are several ways to get the right kind of training for the job you want to fill—through home study from a reputable correspondence school, through technical books, or through a short course in a residence trade school.

A New Service to Readers of Popular Science Monthly

Popular Science Monthly is the meeting place for those who want training and those who are expert in giving it. Thousands of men and boys have been started on the road to greater earning power through advertisements in this magazine.

Now, as an added service to you—to make it easier for you to decide on the training you wish — we have grouped all advertisements of this kind in our new section, "Money-Making Opportunities." You'll find it on pages 120 to 150 of this issue.

It will pay you to turn to these pages—to read over carefully the advertisements of schools and books covering the field in which you are most interested—and then to act! Choose the line of work that appeals to you most, and write to the advertisers in that line for full particulars of their training.

How Thousands Have Already Won Success

Men with no experience, with little education, with nothing to help them but their own ambition to be some-body, have found success through ads in Popular Science Monthly. They naw the announcements of courses of training here. They sent the coupons, decided which offered them the best opportunity, and then, through the training they received, rose quickly to positions of responsibility and greater earning power.

It will pay you to read, "Money-Making Opportunities"

[PAGES 120 to 150]

\$100 in Prizes!

FULL DETAILS OF THIS BIG OFFER AND THE WINNERS IN LAST MONTH'S CONTEST WILL BE FOUND ON PAGE 120 Clerks have become star satesmen—farm boys have become electrical experts—bookkeepers have become expert accountants. Men who had never before been able to earn more than \$25 or \$35 a week, are now making \$50, \$75, \$100 and more. And they don't work half so hard. But they are trained men—specialists in their field—and it's trained specialist, not the unskilled and untrained worker, who gets the big money.

You Risk Nothing When You Write for Details

You can get all the facts about any Course of training advertised under "Maney-Making Opportunities" without the slightest obligation to your-self.

Hence you don't risk a thing when you answer an advertisement of training in Popular Science Monthly. You will lose nothing—and you open up for yourself bigger opportunities, a bright future, more and better chances to earn big pay, than you ever had before.

What Others Have Done You, Too, Can Do!

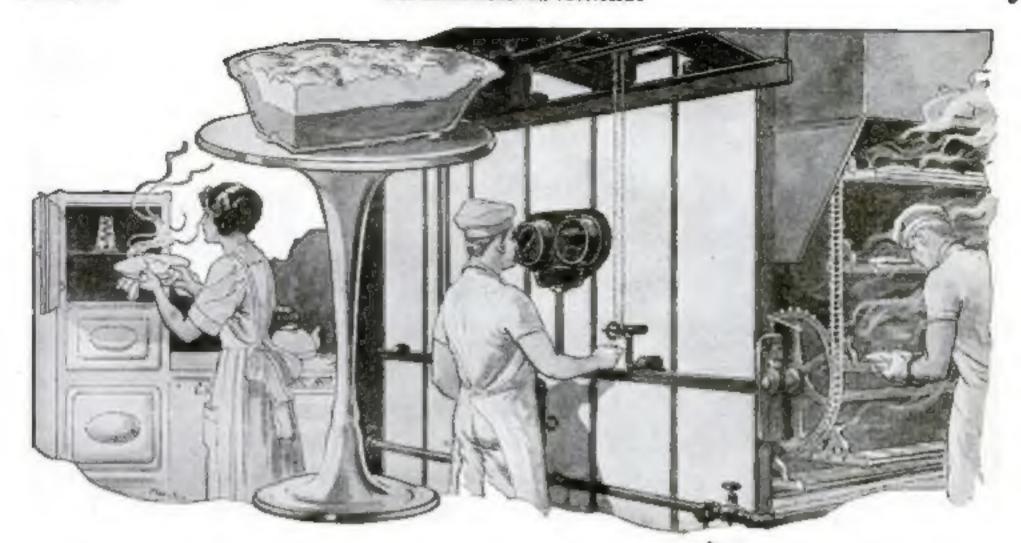
The men who found success through Popular Science ads aren't any smarter or more ambitious than you. They only had the same opportunity that you have now. They simply decided what they wanted to do—and then did it.

Make your decision today. Be a "doer"—not a "wisher." Start now to study the "Money-Making Opportunities" on pages 120 to 150 of this magazine. It may be the turning point of your life!

"What's Your Future?"

Get started now on the Road to Success—sepages 120-150

CHARLES HORSE



Pies Made the Tycos Way

HOUSANDS of pies a day, hundreds of thousands a year-every one with crisp, flaky crust and the filling baked just right.

Uniformity in product, the all essential in modern baking on a quantity basis, is made possible by the use of Free Electric-Contact Temperature Control. No longer do bakers depend on the labor-wasting hand adjustments of the gas valve with the inevitable variations in temperature that means spoilage and delays in delivery. The uniformity that bakers get can be had in home baking if the Taylor Oven Thermometer is used.

Guesswork and uncertainty in baking and in every other industry employing heat processes have been eliminated by the use of Free Instruments for Indicating, Recording and Controlling Temperatures—the Sixth Sense. of Industry,

If you use heat in your manufacturing processes—whether for making armor-plate or baking enamel on cuff buttons, for making rubber tires or hatching eggs or making paints, metalware, furniture or any other product that goes through heat treating processes, you need in your plant Foor Instruments for Indicating, Recording and Controlling Temperatures.

To Manufacturers

Free Engineers have effected substantial economy for manufacturers in every line of industry by applying the 5000 "Sixth Sense." Whatever your problem in the indicating, recording or controlling of heat, there is a 5000 Instrument to serve you. Write us for literature on any instrument, or type of instrument, and it will be sent promptly. Or, if you prefer, our engineers will consult with you on the application of the For Sixth Sense in your plant.

Taylor Instrument Companies

ROCHESTER, N. Y.

Canadian Plant: Foor BUILDING, TORONTO

SHORT & MASON, LTD., Manufacturing Distributors in Great Britain.



Tree Office Thermometers An aid in promoting numan efficiency.

Scap Both Thermometers To enable you to get the most good from your bath,

With Home Set Bake Oven Thermometer, Candy Thermometer, Sugar Meter. The secret of accurace results in cooking.

From Wall Thermometers To help you maintain a nemperature in your house conductve to good bealth.

White Quality Companies To show you the right way in unfamiliar country.

Frat Fover Thermometers A necessity in every home,

From Stormoguide Forecasts the weather twenty-four hours ahead with dependable accuracy.

Ticos Hygrometer To enable you to keep the humidity of the atmosphere in your home correct at all Elmen.

Your dealer will show them to you. Ask us, un a portal, for beaklets on any of the above,



Few Sphygmomanometer, Pocket and Office

Fees Unimalysis Glassware. Foor Fever Thermometers.

Bulletins on request.

SIXTH SENSE OF INDUSTRY





Separating the Good from the Bad in Battery Chargers

ITH the many powerful radio sets now in use, the majority of which operate most satisfactorily on storage batteries, the selection of a good battery charger is an important problem to many.

It is most essential that the batteries be in first class condition if the receiving set is to give reception of the first order. And it requires a battery charger of the best type to keep the batteries in such a condition.

The choice of a battery charger is, therefore, worthy of the same careful consideration as is generally given to the selection of the set itself. The tests that the Popular Science Institute of Standards makes on battery chargers are no whit less exacting and thorough than are made on radio receiving sets.

There are five points for which the Popular Science Institute of Standards tests battery chargers. The first of these is to determine the charging rate. The exact rate for different battery conditions—partly charged, completely charged, etc.—is found. Tapering characteristics are checked.

The next point to be determined is whether the charger requires adjustment and how often this adjustment is required. This is a very important consideration, for the large majority of people who purchase battery chargers are not technically familiar with their construction and will not be able to get complete satisfaction from a charger that requires frequent and complicated adjustment.

By Prof. Sampson K. Barrett

Chief Engineer of battery and battery-charger tests, Popular Science Institute of Standards

The third point for which a charger is tested is general efficiency. If a charger's cost of operation is so high that it offsets the economy of using a charger, it is not approved by the Popular Science Institute of Standards.

It then is determined whether the

charger has an indefinite life, or whether there are parts that must be replaced. In the case of the latter, life tests are conducted on the replaceable parts. If the charger is to give satisfactory and economical service, these parts must be

Quietness in operation is the fifth and final point for which the Institute tests

battery chargers. No charger is approved unless its mechanical and electrical construction is such that it permits reasonably quiet operation.

To make these tests, a battery charger is connected with a supply in the Institute laboratory just as the user would connect it. Manufacturer's directions are followed exactly, thus determining whether these are sufficiently full and explicit.

Meters of high sensitivity then are introduced. The illustration at the top of the page shows quite clearly how these meters are connected. The recording meters make it possible to obtain exact records of the charger performance in continuous tests.

A charger that has passed these tests by the Popular Science Institute is certain to add to, and not detract from, the general efficiency of a radio receiving outfit. Readers of Popular Science Monthly who are contemplating the purchase of a battery charger, or any other radio or tool products, can secure a list of tested equipment by addressing the Popular Science Institute, 250 Fourth Avenue, New York, N. Y.

Send for List of Approved Products

Copyrigms Historia

POPULAR SCIENCE Monthly Guarantee

The above seal on an advertisement indicates that the products referred to have been approved after test by the Popular Science Institute of Standards.

Popular Science Monthly guarantees every article of merchandles advertised in its columns. Readers who buy products advertised in Popular Science Monthly may expect that these products will give absolute satisfaction under normal and proper use. Our readers in buying these products are guaranteed this satisfaction by Popular Science Monthly.

THE PUBLISHERS.



Equip your set with Balkite Radio Power Units

They provide unfailing, uniform current for both circuits





Balkite Battery Charger

This popular battery charger is en-tirely notacless and can be used while the radio set is in operation. If your battery should be low you enerely turn on the charger and operate the set. Charging rate 2.5 amperes. Operates from 110-120 AC 60 cycle current, Special model for 50 cycles. Also for 25-40 cycles with 1.5 ampere charging rate.

Price \$19.50 West of Rockies, \$30 In Canada, \$27.50



Balkite Trickle Charger

Can be enemected to the usual 6-volt battery and left on permanent (or teickle) charge. Automatically charges the "A" battery and sup-plies "A" current from the light

With small bacteries (4-volt and entall 6-volt) can be used as an intermittent charger of the usual type. Or it can be used as a trickle charger if a resistance is inserted to cut the charging ram to the mode of the set.

As an added convenience to trickle charging some owners add a switch which cuts out the charger and turns on Belsite "B" during operation, making both power supplies automatic in operation,

Charging rate .4 to .5 amperes. Bite 5 \ a 2\ a 5 inches. Fits in usual dry cell compartment. Curreat consumption 1/10t per hour. Operates from 110-120 AC 60 cycle current. Special model for 50 cycles.

Price \$10 West of Rockies, \$10.50 In Canada, \$15

Equip your set with Balkite Radio Power Units. They improve and simplify radio reception. With their use your current supply is unfailing and always exactly what is required for each circuit. They reduce the amount of attention you give your set.

The popular Balkite Battery Charger is entirely noiseless and can be used while the set is in operation.

The Balkite Trickle Charger converts your "A" battery into a permanent "A" power unit that automatically supplies full "A" current at all times from the light socket.

Balkite "B" II is also well known. It was the outstanding development in radio last year. It eliminates "B" batteries and supplies plate current from the light socket. It fits any set.

The new Balkite "B" at \$35 is especially designed to serve sets of 6 tubes and less. With such sets it will perform exactly as does Balkite "B" II with sets of larger "B" current requirements.

Noiseless—No bulbs—Permanent

All Balkite Radio Power Units are based on the same principle. All are entirely noiseless in operation. They have no moving parts, no bulbs, and nothing to adjust, break or get out of order. They cannot deteriorate through use or disuse—each is a permanent piece of equipment with nothing to wear out or replace. They require no other attention than the infrequent addition of water. They do not interfere with your set or your neighbor's. Their current consumption is remarkably low. They require no changes or additions to your set. They constitute a complete, troublefree radio power equipment, one that is economical, unfailing in operation, and eliminates the possibility of run-down batteries.

Manufactured by FANSTEEL PRODUCTS COMPANY, Inc. North Chicago, Illinois







Balkite "B"

Eliminates "B" Barteries. Supplies plate current from the light socket. Operates with either storage battery or dry cell tubes. Keepe "h" circuit always operating at maximum efficiency, for with its use the piste current supply is never low.
Requires no changes or additions
to your set. No bulbs—nothing to
replace. Requires no attention
other than adding water twice a

A new model, designed to serve A new model, designed to serve sets requiring not more than 20 miliumperes at 90 volts—practically all sets of 5 tubes or less, and most 6 tube sets. Size 6% in, long, 6 in, ligh, 3% in, wide, Occupies about same space as 45 volt dry "B" battery. Operates from 110-120 AC 60 cycle current. Special model for 50 cycles.

Price \$35 In County, \$47.50



Balkite "B" II

The most outstanding develop-ment in Radio last season. Same as the new Bulkite "B" but will fit any set including those of 8 tubes or more. Current capacity 40 millisomperes at 90 volts. Size 9 in, high, 6% in, wide, 7% in, deep, Operates from 110-120 AC 60 cycle current. Special model for 50 cycles.

Price \$55 In Canada, \$75

The Unipower, manufactured by the Gould Storage Battery Company, is equipped with a special Balkite Radio Power Unit.

AS STANDARD BY THE UNDERWRITERS LABORATORIES

BALKITE BATTERY CHARGER * BALKITE TRICKLE CHARGER * BALKITE "B*

ALL BALKITÉ RADIO POWER UNITS ARE TESTED AND LISTED

BALKITE "B" U

See page 45 years of material



D This stal on a radio or tool advertisement signifies the approval of the INSTITUTE OF STANDARDS









Why Curiosity Pays

ARE you cursous? Why? When? Where? In the evar of my country home in New Jersey is a miniature house, built twenty-one years ago. A small, square house with a peaked roof, about fifteen by fifteen.

Dirth, except for a new roof. Originally it held a Frank in stove. In the dead of winter, the thermometer be, we zero, I could poke a few sticks of wood into that stove and in three and a half minutes the house would be hot I would have to open the window.

I bunt it myself, out of currosity plus

When I moved, I took it with me to my next residence. When I bought my present home, I brought it with me. It has seen the world, has rubbed up against humanity, and has been a shelter for man and beast.

When I die I shall hope to ke it with a some in the sky. But there might be a delay, Besides, I would want the good angels to know that I built this house myself with my own hands, and that it once saved my life, I would be future. All on account of car

When I built it I was very ill trying to beat day and said if I could do some work in the open air, it would help. I had seen log cabins in the mountains. Bungalows then were coming in and I had seen pictures of them.

I am a little man," I said, "but can I

house in my back yard."

I have I leave I never had made anything in my life. Always in the house I was a dered a hopeless mess. Every one

conspired against me. They put me in a steamer chair out in the back yard in the sun, tucked me up, and left me to my curiosi

could I do it? The answer was so, A, could I do it? The answer was was were was were that house was finished my recetain. I had the laugh on them is one of the greatest moving for world. Curiosity killed a cat and Blubeard's wife. It saved my life, To und restand it, to control it, to develop it, to turn it at the right moment, is to be one King Pin among just the few at the top. The ladder of success is built on interrogations. Let me suggest a method,

IDLE curiosity almost always occup if with single objects, and is a waste of to the state of the

world. When any problem presents itself—question it, be curious about it. The mere

Here are four sample questions. They can be multiplied indefinitely. It is one of the most interesting and profitable games: Why am I too thin? Why am I too fat? What makes me bashful? What makes me timid?

When we introduce an interrogation point trail—it never lets up until the answer is

-THOMAS L. MASSON.



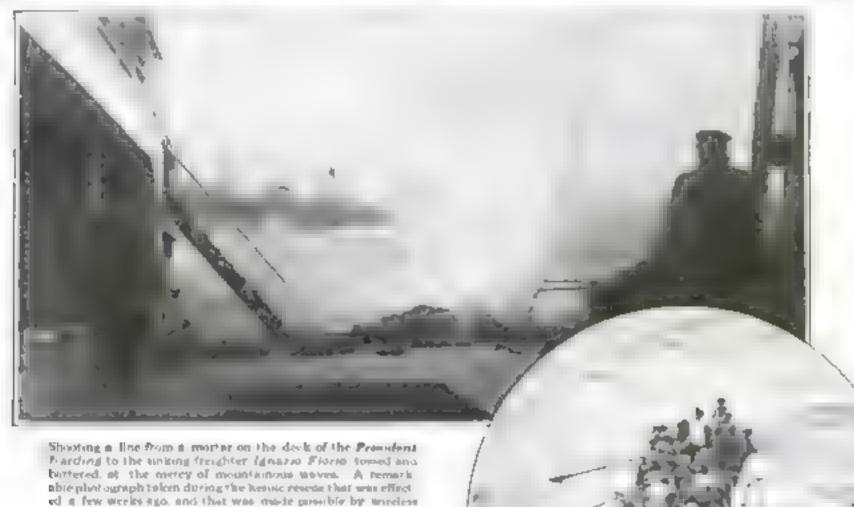


POPULAR SCIENCE MONTHLY

SUMNER N. BLOSSOM, Editor

January, 1026





How an Invisible Lifeline Rescues Men from the Sea

A Story of Heroism Made Possible by Wireless

HEN the Italian freighter fenesio Florio was pitched and tomed a few weeks ago in the mountainous waves and cavernous depths of the worst storm an angry Atlantic has concocted in many years, it was an invisible lifeline that held out hope to ber hadly battered crew. That line was composed of the dots and dashes of Morse code sent by wireless.

A tempest in mid-Atlantic would well he a match for the iron boxes that sail the seas but for that invisible lifeline. Gales that sweep like cyclones, waves that coil and strike like giant sledges, swirling waters that has ominously and churn and churn, still taunt and harrass seamenmuch as they ever did

Ships still are swallowed by a hungry ocean. Even now restless waters are heking the iron bones of the Italian freighter. But, thanks to radio, and to the traditional courage and humanity of one seaman called to the aid of another, those bones are dry of their marrow of

By Peter Vischer

men. Twenty-seven men and a cut were saved from the canted deck of the Ignazio Florio by Capt. Paul C. Grening, of the United States liner President Harding. Only one man and a dog were lost, the one an officer awapt from his bridge by a thunderous wave before the Percident Harding was called to rescue; the other, smashed against the side of the freighter as he trand to swim to his rescuers.

Thus is the ingenuity of man, as expressed in progressing science, succeeding in his struggles against what were once considered insuperable natural odds, acts of a displeased god. Thus is man inventing new life insurance for himself. But for the helping hand of science, storms would have taken a lamentable toll of life during the week the hapless Ignorio Florio foundered.

George Kohle, radio officer of the President Harding, was sitting in his cabin one night, phones on his ears,

eighrette alight. All at once he straightened up. His hands went to the phones and be listened sharply. A switch clicked home and generators began to whine. He had the Florio's SOS. Possibly you heard it on your own radio set. Certainly, if you live in the eastern part of the United States, broadcasting suddealy was stopped for you when the call of distress sounded.

Saved! The doome lifetights er a crow of 27 being carried to safety in

lifeboot manned by hardy valuateers

KOHLE grabbed the speaking tube and shouted to his captain, who was gasing outward from a toming bridge. He broadcast the SOS and got five answers out of infinity -from the Loren, Eleen, Portland Maru, Invergoil, and Cadore. Even then the Harding had changed her course, plunging directly into the vortex of the atorm to go to the Italian's amuistance

Back and forth went messages of hope, pleas for quick help, promises of assustance, requests for directions and bearings, orders for lights and rockets.



Through the Storm on a Ruft

Lashing themselves to a small improvised eaft these aix entions of the wrecked schooner Hatten recently rode safely through a six hour burnesse and doilted for five days without food or water. When finally pecked up by the Haer Southern Cross, all were on the verge of collegee. One of the survivors is holding a pole with handherchief attached with which they attended attention of the lines. The Hattee west down in a seething see off Cape Hatterns, on the const of North Carolina

Even then the Italian freighter was

A mountainous wave had smashed in a forward hatch and water was flowing into her bowels. Water was flowing to a thirsty cargo, a cargo of grain The rudder was broken. One of the booms was off. The lifeboats were smashed

"THAT Captain Grening, he is very I great human ty," said Capt. Accello Lauro, master of the freighter, when he arrived in New York, "for we were in very bad way. We were in very terrible weather with a very terrible carge. Grain, grain is so very bad. When you ship water you had better have wild herses on board than grain. Grain drinks and drinks—and then—"

Yes, the freighter was doomed. But her men were not. For 50 hours Angelo Trombino aloshed about in an engine room that was a death trap, administering to dynamos and pumps. For the same 50 hours Luigi D'Ambrogi sat in a wireless shack and tapped. And fatened. While these two, trained in the uses of science, carried on, there was yet hope.

Finally, after a night and a day of buffeling, the President Harding nighted the freighter. She reeled 'round and round the foundering box. The seas fought to keep them apart; but slowly, plowly, the Prendent Harding drew close.

The next afternoon Captain Grening got out the Lyle gun—a morter from which a projectile with an attached line in shot. The Harding was to windward and oil was poured on the waters to lay the waves. The gun was fired once, twice, thrice, before the line went to the freighter. A lifeboat was floated on the line, but there was no getting into such a comet. Remp lines were sent over, but they parted. Only the radio line was Sexible enough to hold.

At intervals through the night, Captain Grening played his searchlight on the unhappy freighter and realized the craft was nearing her end. He made up his

mind that the moment she started down he would drive for her, run his ship bow to her bow, and drop overboard anything that would float-rafts, life preservers, He meant to save lives if it planks. were humanly possible.

QUCH a desperate effort was saved by a curious full in the storm, a softening in the waves for two hours of the early morning, during which Captain Grening sent over a big Lundy lifeboat manned by volunteers. Every man on the Harding wanted to go. And then Captain Grening made this entry in his log:

"Detention 21 hr. 15 min., rescuing crew of S. S. Ignatio Plorio. Overcast, whole gale, very high sea."

It is within the very recent memory of man that the wireless was first used at sea. The first message was sent from the American liner St. Paul to the Needler on Nov. 15, 1899, as the former was completing her fifty-second voyage across the

To laymen, the success of wireless

assured in 1909, when Jack Binta sent out a call for assistance from the White Star liner Republic after her collision with the Italian Lloyds steamship Florida off Nantucket. That happened Japuwh hy (5005)

T Republic had on board 700 pleasure-seeking Americana bound for a where so pit William to , wen steel conded with the hor are ing 900 rigeants and a crew of 200 From the wreckage of a Marconi room, Binns, cold and drenched and hungry, kept sending out what was then the call of a crippled boat for help:

"C Q D, C Q D, C Q D."

THE quick response to that call was all that saved hundreds of lives.

Two months after the Republic collision, the steamer Horain Hall was aided in distress in almost the same position, Four other times that same year wireless summoned aid to foundered ships, among them the steamer Ohio, from which 150 passengers were rescued off the Alaskan coast. Not a month-hardly a weekhas passed since then without some incident of the same kind

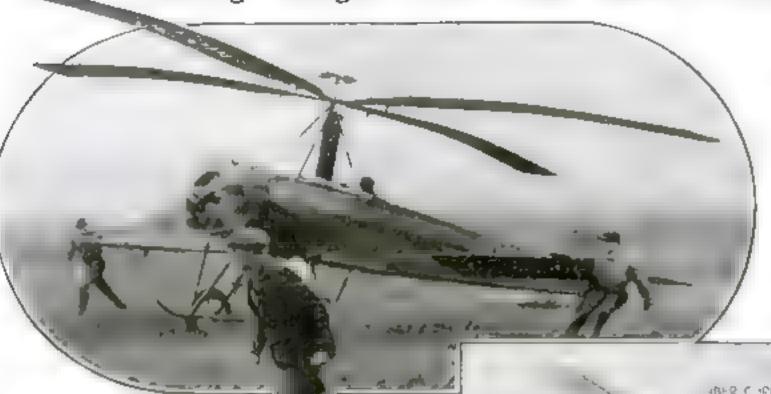
Without wireless, the Titonic, which struck an iceberg on her maiden voyage and sank in mid-Atlantic with scormous loss of life, would have dropped from sight to become one of the world's many maritume mysteries.

More than a thousand American peamen have gone to watery graves in a score of vessels that have disappeared from the face of the earth without a trace. Some of these, curiously, disappeared during this present century, in spite of the eafety to be found in modern means of communication.

These, however, are the exceptions that prove the rule that today we know. The developments of science have made it possible for the seas to be made as safe as land; and, if you'll believe many an old sait, much safer.

Flaps Its Wings like a Bird

Amazing Autogiro Can Land Almost Vertically



The Successful Test Flight

Left: The autogire, piloted by Capt Frank Courtney taking off for its successful test flight at Paraborough, England. By means of its fispping windmill ake urage it rose swiftly flow Descrip 50 miles, then toturning to the starting place, dropped almost verticulty Below Diagram showing constructional details of the remarkable machine. Note the huge lifting screw driven by the wind and turning at from 120 to 140 revolutions a minute

By Arthur A. Stuart

AT FARNBOROUGH, England, a few weeks ago, a group of seronautical engineers and avis-

tion anthusiasta assembled to witness an event that may revolutionize completely the future development of the art of aviation. An odd, awkward looking flying machine, topped with a windmill arrangement that flapped like the wings of a bird, rose swiftly from the ground, accomplished a trial flight of almost 60 miles, and then returned to its starting place, dropping almost vertically and coming to a full stop within 20 feet of the place where

it first touched the ground.

This queer machine, which conforms to none of the usual rules for airplane design, is called the "autogiro." It is the invention of Don Juan de la Cierva, a young Spanish engineer, who has brought it to its present stage of development after five years' work

Vice Marshal Sir Sefton Brancker, of the British Air Force, after witnessing the successful demonstration of the machine, declared that "it is the greatest step in aeronautical progress since the Wright brothers flew the first airplane."

That do in Cierva was working on a revolutionary type of aircraft has been no secret. Several articles describing various stages of his progress have appeared in Popular Science Montelly. The aviation world, however, scarcely was prepared for the sensational success of this public demonstration.

WHEN Capt. Frank Courtney climbed into the fuse age, the tractor air screw was set whirling, the huge blades flapped, and within 300 feet—about one-third the distance required by the ordinary airplane—it had left the ground and was sailing gradually out of sight. Then at the end of the trip came the most remarkable part of the demonstration.

When only a few hundred feet above the ground the pilot shut off his engine. The tractor screw slowed up and ceased to revolve, and the machine floated down



Hovering, with Engine Dead

Hearing the ground the pilot shut off his engine and the machine floated down almost vertically, baseling with a run of 20 feet almost vertically, landing without damage with a run of less than 20 feet. Here, at last, was an airplane that could land on a mere apot; the airplane possibly that may point the way to planes that can land on the roofs of houses or in city streets and parks and thus enlarge amazingly the utility and scope of sircraft.

AL ED N

The machine starts off in the ordinary way by aid of an engine-driven tractor screw. To start the lifting blades rotating, men haul away a steel cable wound round the base of the screw, much as a string is pulled from a top. According to measurements, the autogico leaves the ground with the low speed of 15 miles an hour. Its maximum speed in the air is 70 miles an hour

IN ORDER to stay in the air, an ordinary airplant must keep up high velocity. Even a small loss in velocity may result in an accident. It is claimed that the autogiro is very slightly affected by loss of forward speed, the real speed which counts for sustentation being that of the wing tips, which travel over a spiral path at a much higher velocity than the speed of travel.

Even if the engine abould fail completely, the blades of the autogiro will sustain the plane in the air, allowing it to sink alowly and land safely

Inventions that Edison Still Hopes to Make

Nearly 80, he now works only 18 hours a day because he has to sleep more— But even so, he may give us an automobile battery to last 10 years, and other marvels to make life pleasanter—His remarkable forecasts of future progress-A fascinating, intimate picture of America's grand old man of applied science

By John R. McMahon

is running short of time—has to aleep so much now that his working day is limited to a pitiful 16 or 18 hours. He needs every moment of that short day for his important activities. That's why he has practically quit giving interviews and why he felt that he was doing a considerable favor recently when he talked

to me awhile for Port-LAR SCIENCE MONTHLY

I used to interview America's grand old man of applied aclence when three or four hours of nightly eleep gave him a bit of leisure. He was then crusadlog, as it were, against humanity's victous sleep habit. He almost had us converted when Nature put the brakes on his very self He admits that Nature has licked him into wasteful sneosing. You cannot say that he has the sleeping sickness, yet his daily working time is now only about twice that of the average man. He works only two days in one, instead of almost three, as when he was in his prime.

MPORTANT as Eduon's work is, you feel the man le more important. Might be better if he were made to knock off all work for the rest of his life and just tasked to the American people on how to do it. This father of half the marvels of civilixation should just scold us and cheer us and advise us what to eat for breakfast.

You go away from his Orange, N. J., laboratory in a daze, feeling that you have talked with Moses, Columbus, and Darwin in one. He is the most historical character in the world today. Legends are forming about him. A barrel of baloes are ready to put on his brow am glad there is also plenty of homely stuff, some of which I'll give you, about Tom Edwon, the pal and crony of his men in the experimental shop.

Every one knows what he looks like at

DISON in his seventy-ninth year least that domelike forehead, now that ched as Pike's Peak in winter. Ruddy complexion, gray eyes that often stare and dream. A chunky middle-height figure, careless of dress, who trots about apryly, batless most of the time. A high pitched Voice that may drone or become a bit nasal. One of the most human of menboyish, slangy in offhund talk, and, like

yours and mine -- the whole world's, It is said a traveler saked an Eskimo and then a South Sea Islander who was

President of the United States. Both replied "Edison." When the same question was put to the king of an African tribe, his majesty hesitated between Edison of the talking box and a comedian of the pictures that move. A

discarded incandescent bulb was put on a heathen altar by a native priest and maybe it helped to illuminate the mind of the tribal god.

"Which of your inventions are your favorites?" was the first question I put to Edwon.

"Phonograph, moving pictures," he replied. One may note his economy of language in leaving out "and "

THE answer reminds us many are unaware, that the inventor did ploneer work in moving pictures. This was during a period from 1887 opward to the late 90's, when the world did not dream that pictures could follow action

"Why do you prefer the phonograph and the pletures, Mr Edmon?"

"I like the phonograph because I love music, and there are great possibilities. The motion pictures are my only theatrical diversion on account of my extreme deafness "

The inventor of the phonograph not only loves music but selects the artists

and the compositions for the records of his machine. He used to have a flock of prime donnes in his laboratory, trilling and warbling under his personal direction. Seems to me like the high C of versatility for the same man to invent, manufacture, and then act as bandmaster for his recording songbirds. As for his "extreme deafness," that is a small and casus: handicap; he has been more or less deaf for many years. Beethoven was deaf mest of his life.

EDISON says-

"THERE is no limit to the invention of fully automatic machines. Man will work less and less."

'The sun engine will come when the price of combustibles greatly increases."

"It is possible to make a concrete house in a few hours."

"The world doesn't need more inventions just now, until general intelligence has increased so men can be had to operate what we have."

"What new lines of research am I engaged in? Many. Wait until I've caught the fish."

"My favorite inventions-phonograph, moving pictures. I like the phonograph because I love music. The motion pictures are my only theatrical diversion on account of my extreme deafness."

"I now sleep from five to six hours. The quality is still perfect."

"I eat very little. The amount of power one can get out of a piece of toast is marvelous."

"The number of men in every nation, per capita, who are honest, humane, and intelligent is increasing. This number is a measure of our civilization. The Lord appears to be in no hurry."

most great men, always unconscious of self

After patenting more than 1000 inventions, of which several are major contributions to human progress, has Edison another miracle or two up his alseve? 1 asked him that and you'll see he dodged the answer. My bet is in the affirmative. Assume such a man and such a record, still able to work two days in one, he can't help adding another ornament or so to the monument of his achievement And that ornament will be our gain-



"One of the Most Human of Men"

A chunky, middle-height figure, careless of dress, who trots about spryly, hatless most of the time. A domenke forehead, now thatched as Pike's Peak in winter, ruddy complexion, gray

Thomas A. Edison as He Is Today

eyes that often stare and dream. A high pitched voice that may drone or become a bit maal. Boyish, slangy in offhand talk, always unconscious of self. That is the great Edison at 79

"What about that sun engine?" I maked, relating to his old project of getting energy direct from the sun's rays. He had a model, I believe, to which Sol contributed a fraction of the potential ballons of horsepower

"It will come when the price of combustibles greatly increases"

A humorist may comment that, thanks to the coal strike, the sun engine is now due. Without question, such a machine is practicable in desert or cloudiess areas. Something of the sort has been reported in use in Egypt. Last summer an egg was cooked by sun heat on a Washington pavement, according to report. Let's laugh now; posterity will laugh at us. "And your poured house, Mr. Edison?" I asked. "Isn't this now practical commercially by use of the new bauxite cement that hardens in 24 hours?"

"It is possible to pour a house in a few hours," was the reply. "The commercial man of vision has not yet come forward. Portland cement is all right, as it can be made 'quick set.'"

It may be explained that for this scheme the inventor has set up the mold of a complete home in cast from plates, smoothly machined and bolted together. There was reinforcement within the mold Liquid concrete was to be poured in at

the top, making the house in one operation. At the time of the house project, Edison told me it was his pet; he hoped it would be his special gift to working people who wanted a substantial home, he was not going to accept a penny for that invention. Let's take the will for the deed, and hope that "the commercial man of vision" will yet get busy on this housing stunt. In the laboratory yard I saw a sample of house ornament in cement that has been weathering for years and looks like new.

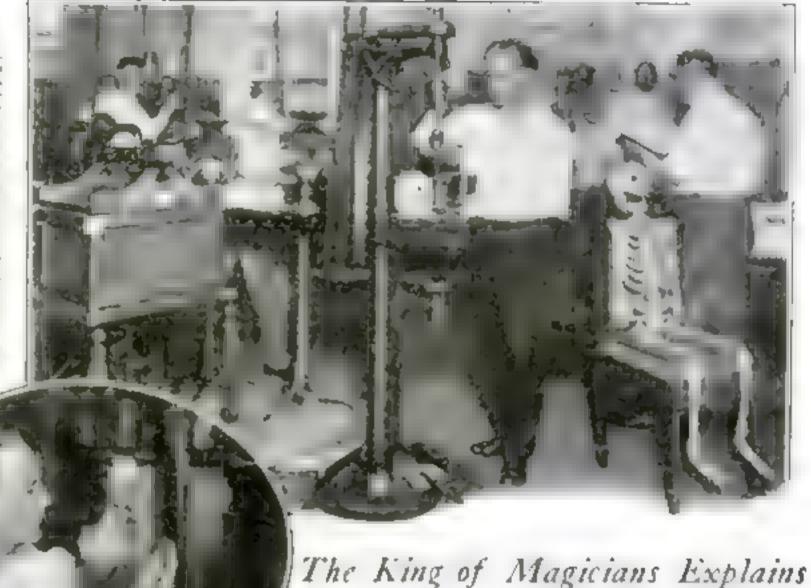
"Has the alkaline storage battery been further perfected?"

Continued on page 132.

Lessons in Magic—By Houdini

In Houdeni's Laboratory

The photograph at the might above House and he besidence in the magacian's New Table Autorit out he the comproperty and easier and a solution of the solution ht his stage work Reference many and tricks, however war be performe Margh streather in a columnate as Mina desir aren metra es-In he in stepar v play metallies who if prome in page Huudini is per forming in the p I T DOT NO. OF



IN THE course of my discussion of the tricks of fraudulent spiritualistic mediums in the last two numbers of Popular Science Monthly, I mentioned several times the legitimate trickery that professional magicians use to entertain and amuse. In this article I am going to tell you something definite about that kind of trickery. In fact, I am going to give you a lesson in magic—teach you how to do some most effective tricks with which you can mystify your friends.

The tricks I have selected are simple and require no apparatus beyond common objects that you will find at hand almost anywhere. You can learn the wellod of performing any one of them in a few minutes, and, even if you never have previously attempted to be an amateur magician, you ought to be able to acquire the dexterity necessary to perform them perfectly by a little practice. Simple though they be, however, they are real professional tricks that I myself use or have used on the stage, or that have been used by some of the most famous conjurers that the world has

Possibly as good a way as any of illustrating how a trick most simple in detail can mystify and bewilder even an exceptionally intelligent and wide-awake audience, is to describe a trick that I performed not long age at an entertal most given by a secret order in a had in the upper part of New York City.

I borrowed three handkerchiefs from the audience, had them marked for identifleation, knotted them together, and placed them under an opaque glass bell on a table. Then I informed the audience that I would undertake to transport the handkerchiefs magically from beneath the bell to any place that might be selected within 16 miles of the stree. The place was to be chosen by vote, so I dutributed slips of paper on which the members of the audience might write their wishes. The slips were collected, placed in a hat and brought to me on the stage. I dumped the votes on a plate, picked up three of them and had a little girl select one of these. When this was unfolded by a gentleman from the audience, he read.

"UNDER the top stop of the Status

Immediately a titter went through the audience. The Statue of Liberty, as you probably know, stands on a little island in New York Harbor, 10 or a dozen miles away from the hall in which I was performing. That I should claim that by waving my wand I could cause those three handkerchiels to be walted invisibly over the city and hay and to be carried up the narrow winding stairway

h the interior of the statue seemed highly ridiculous

Simple, Mystifying Tricks that Any

Imateur Can Perform at Home

I acknowledged the laughter; then I requested the audience to select a committee of men unknown to me and of such character and standing that they could not be bribed or otherwise persuaded to aid me in deception. With this committee I left the hall, rode in the Suhway to the Battery, and took the steamboat to Bedloo's Island, where the statue stands. The committee mounted the stairway and under the top step found a locked metal box. With this we returned to the ball, where the persons attending the entertainment were by that time sitting at a banquet.

IT WAS necessary to call in a locksmith to open the box, and inside it was found another box of tin, sealed with solder. When the second box was opened there were the three handkerchiefs!

Now you may suspect that I myself carried the handkerchiefs to the statue, hiding them from the committee which accompanied me and placing them in the boxes by some feat of conjuring. I assure you, though, that I never touched the handkerchiefs from the time the audience saw me with them on the stage until the locksmith opened the boxes in the banquet hall. This is the way the trick was

Under my waistcost I had three other

handkerchiefs, knotted together just as I knotted the handkerchiefs obtained from the audience. I made a "switch," taking the prepared handkerchiefs from beneath my vest and substituting the handkerchiefs I had borrowed. Then I placed my own handkerchiefs under the glass bell. In doing so, I contrived to drop the bell to the stage and break it—a piece of pretended carelessness which I had previously rehearsed.

ACTING as though chagrined by the "accident," I called to my assistant to hand me another glass cover, and, as I met him at the wings to take it from him, he deftly took the handkerchiefs from beneath my waistcost, hurried out of the hall, took the subway to the Battery and caught the hoat for Bedloe's Island. On the island, another assistant and a tinemith were waiting for him. The boxes were heatily prepared and placed on the statue stairs, where they were waiting for the committee.

The Statue of Liberty boats operate on a definite schedule, so it was easy for me to time the performance of the trick so that my assistant would catch one boat and the committee and I a later or, giving my confederates ample time which to box the handkerchiefs

The choice of the statue, of course, was made by me and not by the nucleace. Concealed in my hand, I had three as a of paper on each of which I previously had written a "vote" for this place. When I dumped the votes of the nucleance from the bat, I placed these three slope on top of the pile, then picked them up again and offered them to the little girl

Thus is a trick that is quite within the expabilities of an amateur performer.

In these days of motor care, you might even permit your audience actunily to choose the place to which the handkerchiefs are to be trassported; then, when the choice is announced. DAYE your confederate dash off in a car and leave the handkerchiefs at the spot designated

HERE in a trick, not so complieated though probably more difficult in that it requires not a little dexterity, skill, and "patter," or small tak, to "put it across" properly. It is a trick that many famed magiciana have used nucceasfully. You tear up a cigarette paper, roll it into a small ball, then open the ball and thow the paper untorn and undamaged except for a few wrinkles.

As a preparation for the track, roll a cigarette paper into the smallest hall you can and conceal it in the fold of skin between the thumb and first finger of the right hand. I have indicated the position of the pellet in the accompanying photograph, although the thumb and forefinger, of course, must be held closer together for purposes of concentment when you are actually performing the trick. Then take a cigarette paper and tear it into four or five strips. Roll these strips between the finger tips into a little ball. Work thus down between the palms and continue rolling as though desiring to compress the paper still further.

This will give you an opportunity to remove the prepared ball from between the thumb and forefinger to the palm of the right hand, while you she the torn ball into the fold between the thumb and forefinger of the left hand or between the tips of the thumb and forefinger of the right hand where it will be concealed by the untorn paper. A little practice

Houdini Shaws
How a Perfect
"Spirit Glove"
Can Be Made

CPIRITUALISTS may only a disembodied of spirit can make a paraffin hand; that a human hand cannot be withdrawn from a mold of paraffin because the west as a much smaller than the wide part of the hand. Mouding shows here how a perfect "glove" of paraffin can be made. The hand is ground, then alternately dipped into the cold water in the just the center and molten paraffin in the can at the right until the desired thickness of paraffin is obtained. With the index finger the edge strong the wrist is gradually however, and the hand is thrust into the water to paraffic between

the hand and the pavaffin. Then the hand is threat into the can of warm water at the right. This softens the paraffin sufficiently to permit the withdrawal of the hand. With the paraffin kept soft with warm water the switt of the glove is manipulated to the correct size and shape. Molds of hands to virtually any position can be made by this method even two hands clasped. This is Houdini's first expose of this spiritualistic trick which is interesting not only to investigators of psychic phenomena, but also to implement and others who might find the for a method of making perfect reproductions of the homes hand

will enable you to do this swift,y and invisibly to your audience.

Take your prepared ball and slowly unroll it. When it is smoothed out as much as possible, let it flutter to the floor. The eyes of your audience will be drawn bresistibly to the falling paper, and this will give you an opportunity to get rid of the ball of strips by some natural movement that will not be detected.

THERE are several other ways of performing this trick. The method I have given though, is possibly the simplest, and hence the one best suited to a person who is not an experienced magnian.

Here is a simple trick that is bound to provoke amazement and wonder: You take a piece of paper, helf a sheet of newspaper, say, roll it into a ball in front of your face, then take your hands away—and the ball remains suspended in the air! Not only that, but it will obey your commands to rise or fall!

The secret of this trick lies in having a song hair suspended from your ear or temple with magician's wax. There is also a tiny bit of wax at the other end of the hair. You affix this latter piece of wax to the wall or to the side of a bookcase or some other article of furniture, a thing you can do easily without arousing

thing you can do easily without arousing suspicion. Then you roll up the paper around the bair, and, when you take away your hands, it remains apparently floating in the air. By moving your head slightly forward or backward, you can close the ball to go up or down at your

A simple trick that can be performed so resolutly virtually without practice, and one that will mystify almost any

> audience, is known to magicians as the "One-Ahead Envelope Trick"

> You distribute envelopes and sheets of paper among your audience, requesting each person to write a question on the paper and seal it in the envelope. Then you collect the envelopes, hold them one by one against your forehead and read and naswer such question apparently without opening the envelopes.

THE simplest way of performing this trick in with the aid of a confederate in your audience When you have collected the envelopes, pick up the top one, hold it to your forehead, and, after appearing to concentrate for a moment, ssk any question that hapconfederate will acknowledge this question as his. You answer it; then you open the envelope, as though to check the accuracy of your reading, and read the question written on the sheet you find within.

Holding a second envelope to your forehead, you repeat aloud the question that was contained in the first envelope. The person who wrote it, of course, will acknowledge it; you give your answer, and, under pretext of satisfying yourself as to the correctness of this reading, you open the envelope as before, thereby learning what the next question is. You proceed in this way until you have answered all the questions. It will be necessary for you, of course, to reach the envelope containing your confederate's question last of all.

YOU can also perform this trick without a confederate. When the envelopes have been collected, pick one up at random, hold it to your forehead, and, pretending to read the contents, say, "Why does Lillian love me?" or something equally unlikely to be acknowledged by its sup-

posed writer. When you get no response, pretend to be displeased, and say, "Well, if you won't acknowledge your questions, I can't very well proceed with the test. I'll try one more, though." Then open the envelope and repent its contents as you hold the next envelope to your forehead. In this case it will be necessary for you to have in the pile one envelope more than the number actually collected from your audience. Otherwise you're likely to be embarrassed by finding that you've answered all but one of the questions and have no envelops with which to proceed with the trick.

There are many other versions of this trick. The key iles in discovering the contents of the first envelope. Your own ingentity may suggest other methods than those I've mentioned. As a hint Alcohol will make even the best grade of paper almost as transparent as glass, and it evaporates so rapidly that its use is not likely to be detected by ordinary audiences.

HERE'S another simple but "showy" and affective trick. Take four or five packages of paper clippings, each of a different color, say red, green, yellow, blue, and white. Open them and place them in a grass bowl or jar that is large enough to receive your entire hand. Ask some one in your audience to mux the paper thoroughly. Then when the different colors are mingled virtually beyond hope of separation, ask the mixer to plunge his hand into the jar and draw out a handful of blue paper only. He will heatate and look at you in bewilderment.

"What!" you say to him. "You can't do it? Here, let me show you." Then thrust your hand into the bowl and draw out a handful of the color you have

mentioned

Then say, "Well, now that I've shown you how it's done, you ought to be able to take out a handful of red. What, you can't? Look!" And proceed to plunge your hand into the jar again, this time drawing out red paper only. Repeat the



The Cigarette Paper Tear

This highly expetifying trick consists of tearing a regardle paper rate strips triling it into a term ball, and then unfolding it to show it tempured. The secret has in having another paper rolled late a policy and concealed at the teat of the thoubs as shown in the larger picture. When the other paper is one it is rolled into a ball and hidden between the tips of the thumb and foretinger as shown in the tips of the thumb and foretinger as shown in the tipper picture while the prepared paper is unrolled. The audience of course in out aware that two pieces of paper are used

test until you have demonstrated conclusively your ability to draw out any of the five colors at will

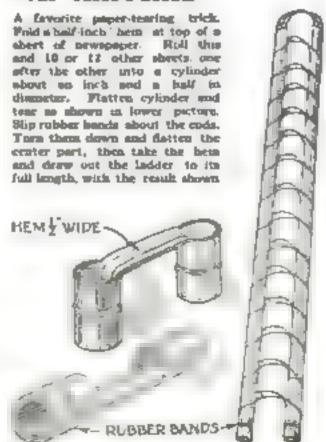
The trick in this case lies in having little packages of paper of each color bidden under your vest, or in lattle packets sewn to your transers. Each package is secured by a strip of tissue paper of the same color as the paper it binds. When a certain color is called for, get hold of the

proper package, place your hand in the

bowl, and, with your movements screened

by the paper in the bowl, work your

The "Jacob's Ladder"



fingers until you've broken the tissue paper seal. Then take out your hand, and, moving your fingers so as to separate and crush the hits of paper, let the clippings flutter down.

I have found that simple tricks performed with household utensils and similar objects are much more effective for an impromptu display of magic than are more complicated illusions, requiring apparatus that the performer "just happened to bring along." Even if your

Pened to bring along." Even if your apparatus is nothing more than an ordinary pack of cards, the fact that it is yours will arouse the suspicions of your audience, whereas you can "get away with murder," as the saying is, in performing tricks with articles that you pack up apparently at random.

A GOOD example of such a trick can be performed with a table knife and six bits of paper. The precess of paper, which are carefully torn so as to be exactly the same size

and shape, you moisten and affix to the knife blade, three on a side, those on one side corresponding in position exactly with those on the other. Explain to your audience that each little piece of paper is so fond of the corresponding piece on the opposite side of the blade that, if you were to remove one, the other would go away.

Illustrating this, you remove one piece, roll it into a little ball and throw it away And, sure enough, when you show both sides of the knife, each contains only two pieces. Removing another, you show there is now only one on a side, and, when you take away the last one, both aides of the blade are found to be empty.

Pause a moment. Then look at the knife in surprise, and say, "Hello! I just heard three little taps. Sounds as if some of the papers were back!" You rame the knife, turn it about, and there are three papers on one side and none on the other You hold the side containing the papers uppermost.

"Well," you say, "If those three are back, their partners will soon be here. Ah, here they are!" And you turn the knife over, showing three papers on each

pide as at the beginning.

TURN the knife over several times, then stop as if latening for a moment, and say, "Well, those three that just came back have decided not to stay with us after all. There they go." And, when you turn the knife about again, one aids is found to contain three papers, while the other is empty. Pass the knife around, and let your audience see that three papers only are on the bade.

The secret of this trick is a simple sleight of hand through which you show the audience only one side of the knife while making them believe they are

neerng both

The kinie is held close to the table at which you are sitting, with the point away from your body. The upper end of the handle rests on the middle foint of the forefinger, with the thumb on top. In this position only one aide of the blade is visible. To show the other, ruise the point of the knife to your chin.

Continued on Suga 140.

Is This the Face of Future Man?

Our Descendants Will Have Cramped Brains, Pinched Cheeks, Long Noses, Squinty Eyes, Says Noted Evolutionist

ILL the faces of our descendants

of our grandchildren's grandchildren—look anything like the
rather queer illustration on this page?

Will then of the future have small, cramped brains; sparse bair; long, thin, and prominent noses, tlay, "precious" mouths; harrow, squinty eyes; and no jaws or check bones to speak of? Will

they, in brief, resemble waterblooded, "esthetic," meagarly nourlahed morous?

The answer is an unqualified, disheartening affirmative, according to at least one competent authority; and we must pull ourselves together to see just how such startling and undoubtedly distasteful forecasts possibly can be sustained. Already, evidently, our facial architecture is beginning to depart from the powerful, virile characteristics of our hardy ancestors, and to assume the lack-adassical features of this "future face" of ours.

How so? Let un see:

Sciontists since Darwin have agreed pretty generally that man has arrived at his present physical stage through a long process of development from lower and perhaps less perfect forms of life. But if evolution has thus been going on all through the post and up to the present moment, will it not continue into the future?

If SO, then surely it is legitimate to inquire as to the direction in which we human beings will develop and how rapidly we will do so. In particular, if we compare our present features with those of the Java speman of some 500,000 years ago, or even the mummified skull of Rameses II of ancient Egypt, and if we notice how much the face of, say, the present Prince of Walco differs from these—then indeed we may well ask what the physiognomy of our successors on this planet will look like a few thousand years from now

A sober and logical, if unpleasant visualization of our future face recently was proposed by the nated British biologist, Sir Arthur Keith, Fellow of the Royal Society, in an important discourse that he delivered before the Royal Institution on "The Rate of

Man's Evolution "

Before arriving at his sensational estimates, Sir Arthur had examined and made records of hundreds of buried skulls of all ages (from the fragments supposed to date back to 500,000 R.C. to the present day), and also had measured carefully the heads and features of thousands of living persons.

His general conclusion: "Evolution

By Ernest Brennecke, Jr.

may be tabulated in detail as follows.

I. Man's brain capacity is growing steadily smaller. ("From the limited data at our disposal we must infer that the people who occupied western Europe at the close of the Ice Age [10,000 a.c.]

Yesterday, Today, and Tomorrow

Oth artist has pictured here how the face of mass in any appear a few thousand years bence, based on predictions by Sir Arthur Krith. He also has drawn a striking trimperium between the face of prehaturic main and that of present day main, showing how the processes of evolution have tended away from the powerful, virile features of our hardy successors, toward the "ant" characteristics predicted for future man. Evolutionists point out that the ragged features of the caveman were born of the fierce primeral struggle for existence, and that with civilentium these characteristics have been softened

stood distinctly above their successors of today in the matter of brain size. So far as concerns brain capacity of the skull there has been no increase.")

2 The roof of our civilized human mouth is becoming reduced in aire and narrower.

3. Our jaws are receding

4 Our nose is becoming sharper, narrower, and more prominent.

Our eyes are becoming narrower, and are sinking more deeply into the face.

6. Our cheek bones are becoming less

7. Our whole face is becoming narrower,

Now, if these processes go on according to Keith's schedule, the human head is destined gradually but certainly to assume the proportions indicated in the illustration.

Those who dispute this and maintain that modern man has ceased to evolve, said Sir Arthur, usually cite the similarity between the modern and ancient Egyp-

> tions to prove their contention. Only 10 years ago, he himself believed that the evidence from English excavations led to the same conclusion. But his opinion was altered by his most important investigations, carried out in recent years.

> He took 50 skuls (25 of men and 25 of women) from English graves that were known to be 1000 years old or more; some of them wore as ancient as the Pyramids. He carefully compared these ancient skulls with those of corresponding men and women who had lived in England in the eighteenth and nineteenth centuries. The result convinced him that the changes hoted above actually have taken

place—actually are taxing place.

WHAT is more, these changes are taking place much more rapidly than generally is supposed. The modern type of man appeared in Europe at the close of what in called the "Mounterian Period" -- as lately as some 22,000 years ago. He was bigger in bie brein, etronger in bie jaw, and had a more rugged countenance than his direct descendants of today. Some of his characteristics have rapidly toned down, while others are becoming more accentuated. His prominent cheek bones have been sinking in; his rather flat and wide nose has been jutting forward and becoming thinner; his mouth is still getting smaller and his chin to

"It may be said," declared Keith, "that the changes I have described are due to diminished use of the laws in modern people. . . . I do not

think we can accept this as a true explanation, for the changes I have described are confined to about 80 per cent of the modern population; 70 per cent show no such change, and yet all live on approximately the same dietary. The cause lies deeper than a mere disuse of jaws; certain stocks and families show these changes more than do other stocks and families. Such evidence as I have gathered points to an increasing frequency of these new characters during recent centuries. Apparently evolution makes its conquests in the way just described; progress is made by climbing the scale of percentages."

Snakes Are Safe if You Know



AKE this fellow, for instance—if he nipped you he'd leave enough poison in the wound to kill two or three men. You would die in fearful agony before nightfall. Your limbs would be ewoilon to twice their normal size, and your face distorted out of all semblance to your former self."

Joaquim, my guide at the Butantan snake farm, was speaking. Crawling about our feet were reptiles gathered from the jungles of Brazil and given free board in return for their deadly venom at this strange South American farm, the only one of its kind in the world. Collected at Intervals, the venom is used in the manufacture of make serum, practically the only thing that can save human beings from death when struck by a possonous

As Joaquim sketched his encouraging picture of my hypothetical fate, he was hauling a dingy greenish reptile, four feet long, out from one of the small, domeroofed dens that look like Eskimo igloos.

"A pretty specimen, isn't hel"

I couldn't agree with much enthusiasm. "He's a jararaca," said Josquim. "The notorious fer-de-lance, you know. I've seen men suffering horribly within three minutes after a bite by one of these fellows, and losing consciousness within another five minutes. Death from such a bite used to be inevitable. Now our enake-bite serum will save a man when be geoms to be already in the last throes."

Josquim slipped the jararaca over the hooked and of a stick be carried, and we moved on. The reptile's head and tail dangled toward the ground, and his forked tongue flicked in and out as be writhed impotently.

Joaquim was using his grotesquely burdened stick to point out other reptiles that were wriggling slugguhly through the grass of the inclosure.

"Just don't step on them, and they'll leave you alone," he said reassuringly

"They couldn't strike through your guiters, anyhow. All the employees here wear leggings, and that's the only protection they need.

"Here, take this one yourself," he urged, handing me the snakedraped rod he still was ides carrying. hold bun well away from your body, and you're safe. He can't reach you. He's belyless to do anything but writhe around unless he can get a good purchase on the ground. He can't strike unless half his body is on the ground, and he can't strike much more than a third of his length under any circumstances.

"Besides, they're all of them rather torpid these cold days," Joaquim added. "Look." He stooped down, seized another perpent right behind the head, and lifted him shoulder high for inspection. "A jararacuçu, this little darling. One of our deadliest species. He'll inject a cubic centimeter of poison at a shot."

WITH fangs showing, the five feet of snake hung inert.

"One of the men in our laboratory was

bitten in the finger by a Jararacucu some time ago," said my guide. Within half an hour he was blinded, bleeding at mouth and nose, shivering in a cold sweat and barely conscious. His whole arm was throbbing with indescribable pain. He was treated promptly with serum, but it was three days before he was fully recovered. Without the serum nothing under heaven could have saved him from a terrible

"Yes" Joan tim commented, holding the jararacucu up in front of hus face and eyeing him. coldly, "you're a tough customer, you are. But



A Venomous Frog.

Dangling a venumous Bramuch from Its posses causes blindness. Note the posses glands just back of the head

How to Pet Them

By Francis Gow-Smith

The remarkable experiences of Francis Gow-Smith former Purdue football star and now an explorer in Brazilian jurgles—in the world's strangest anake form, are particularly interesting in view of the recent visit to the same form made by Raymond L. Ditmars, curator of reptiles in the New York Zoological Park. Ditmars, took with him a quart of tattlesnake venom produced by 2500 snakes, to be used in the manufacture of anake-bite serum for the United States

you're sulky these days, aren't you? This fellow hasn't eaten a thing for two months," he added to me. "I've seen some of our anakes fast six months or a year. But they aren't any the less possenous when they're fasting."

He let the make's dang mg body slowly down onto one of the domes—then suddenly released his firm grip on the creature's neck and promptly departed.

"We don't take any chances, you see."

I TOLD him I hadn't seen him do anything but take chances so far, and I gingerly returned the snake he had consigned to my charge. I had come to the atrangest snake farm in the world purely on business—not for the privilege of petting leashed lightning.

Fact of the matter is, I never did waste any affection on analog. I've met them occasionally in the jurgles, and I've seen Indians die hormbly when bitten by them Uncanny in motion, staring unblinkingly with gold, beady eyes, snakes look at man across one of evolution's bridgeless gape

After all, in an encounter with any other creature of the jungle, you fight more or less with the same weapons You recognize a common inheritance of

brain and eye and limbs and But the snake, that weird auryivor of an ancient and mistaken experiment in evolution, belongs not to this world but to another geologic age. Brasslem, stupid, blindly vicious, he kills anything in his path, by the most mysterious of means-venom. Venom, that age-old, atrocious agency of treachery. The ultimate explanation of its deadliness is still a mystery, even down here in Sao Paulo, where Dr. Vital Brazil, director of the Butantan Seropathic Institute, has accumulated more practical information about poisonous snakes, I believe, than any other scientist in the world.

DOCTOR BRAZIL makes the only really effective anakeblte antitoxin to be had anywhere. He's been working on this for a quarter of a century, and has become very much of a hero to his fellow countrymen. They look up to him almost with awe.

And no wonder. Even as it is, 5000 persons die every year in Brazil from snake hite, not counting nameless hundreds of Indians.

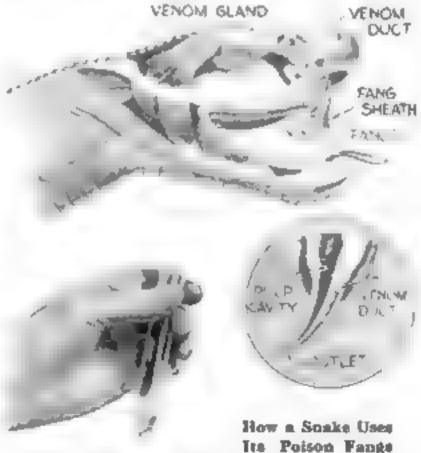
At least another 20,000 are bitten and suffer gravely before recovery. The figures would be worse still were it not for

Doctor Brazil's unremitting and energetic campaign against every species of poisonous snakes and his perfection and distribution of the antitoxics.

Snakes indeed are so grave an economic problem here that the government itself aupports the Butantan Institute. Doctor Brazil estimates that reptiles cause his country a direct economic loss of \$8,000,000 annually. Only India, with its 20,000 deaths caused annually by the sacred cobra, has a worse record.

Ever since I began exploring the mynterious hinterland of Brazil, I have thought of it as a region over which the menace of polson broods ceaselessly. I have been assailed by the poisoned arrows of the Chervantes Indians. I have seen men suffering from passenous wounds inflicted by acorpions, centrades, tiny flies, huge spiders, and even by fish and from.

As soon as I finish writing this I shall turn northward again, across the last frontier and into trackless jungles where unfriendly Bororos prowl. There is no



The upper drawing above how venous from a gland in a rattletouter's head is ducharged through a duct that leads to the two fangs. These field back when the pass are closed, and spring down into striking position when they are open. In each fang is a venom outlet as shown in the circle. The test tube at the left holds one cubic centimeter of the amberculated possesses finid discharged by a striking rattlessale:



The reatier is one of the most feared of all makes—alow to act, but savage and deadly sure when it strikes. Its rattles—the number of them varies with age—may be seen at the tail tip

antidote for the poison they use on their bone-tipped arrows. Frankly, I fear the snakes less, for the explorer seldom even sees a serpent. Yet it is folly to go into the jungle without snake-bits serum, and I came to Butantan to procure a supply.

Doctor Brazil tells me he is working to develop a serum to fight some of the other posson menaces. "We have a tiny fly," he says, "that bites and leaves only a red spot—no more annoying than a mosquito's bite. But gradually a sore develops, the infection spreads, and the whole limb rots away in ghastly fashion. I think we can conquer this with serum."

HE LED me into the laboratory and dangled a repulsive frog in front of my eyes. "His poison causes blindress." He put the frog ande to show me a monstrous spider, as large as a soup pinte, that is nearly as dangerous as some of the five-foot enakes that wriggled over the lawns outside.

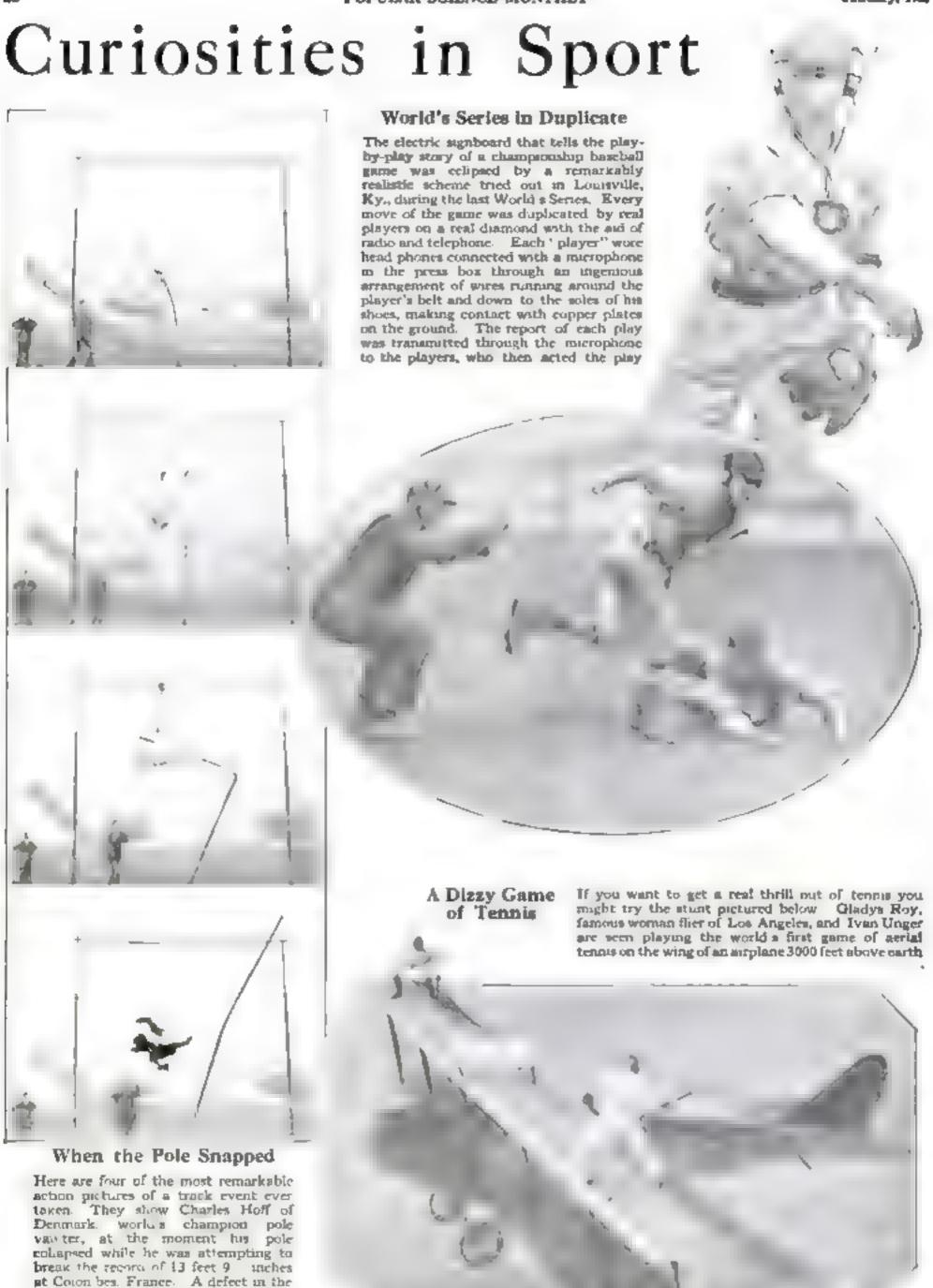
Yes," said Doctor Brazil, "we have a fine assortment of venum-using creatures down here"

The Seropathic Institute at Hutantan, which is a suburb of the city of Sao Paulo, consists of the laboratories, the stables where the serum-producing homes are kept, and a number of walled inclosures for the enakes. Each inclosure, with its dome-shaped dens, is separated from the low surrounding wall by a most to keep the teeming anake population where it belongs.

AS WE picked our way through A these inclosures, my guide pointed out the snakes that are most dreaded in Brazil. "That one with a dark gray pattern on a yellowish background is the surucuga. After the rattler's, his porson is the most virulent. He is swift and powerful and may grow 10 feet long. You've probably beard of him under the name 'bushmaster,' which in itself is dreaded by those who know it. You're more likely to meet one of these savage snakes in the virgin jungles, or near the streams, than any other kind. Look out for them.

Continued on page 134,

wooden pole caused it to give way at the center when Hoff had risen mulway to the bar. Only by the narrowest margin did Hoff escape serious injury



What a Cleaner Has Learned about You and Your Clothes

How automobiles, ice cream, lipsticks, and radio leave their marks on your apparel. The difference between a moth hole and a spark hole—Where stains come from and simple ways to remove them

WELL known New York physician stopped his car the other day before one of our dry-cleaning receiving stations. He hursted into the store, dropped a package hefore the girl behind the counter, and was out again before she had time even to reply to his words:

"Can't wait a minute, Miss Larkin. But you know what to do with this—don't forget the creases!"

The girl smiled. She opened the package, took out the suit of clothes, examined it, and made some notes on a card. The doctor has brought his suits to us every three or four weeks for years, and every one In the establishment who has anything to do with men's clothing knows what he wants. He wants every amaltest spot, visible or invisible, removed. He wants his trousers creased down to the cuff, but the cuff turned up uncreased. pleaves must be rounded without creases, and he won't wear s coat unless the lapels are rolled. He hasn't varied these requirements in years. He would send the nult back if we forgot and creased the cuffs. But he has us trained now, and we never do forget

MEN who send us their suits for dry cleaning are more particular about the two creases in their trousers than any woman is about the plaining of an entire skirt

Dry cleaning has more to do with the fashion of the creased trouger than most people think. Before dry cleaning methods were known, clothes had to be washed with water, which makes them a shaperess mass. Gasoline, bensine, and naphths, however, remove soil without affecting the garment's shape. They retain even creases and plaits—the final pressing merely sets them in more firmly, Dry solvents, in other words, are chemically inert as regards the fibers of the fabric. This cleaning method isn't so old. either, as generally is thought. It dates from 1856, when a Frenchman discovered that camphene cleaned clother without affecting the fibers. The whole dry-cleaning industry By Watson G. Clark

has grown from that aimple discovery
Speaking of creases, a popular movie
actor recently sent us two suits to be
cleaned. Our boy de ivered them, carefully wrapped in a box, but when the

Watson G Clark President of the Borrett Nephews Co., New York City one of the largest dry-cleaning establishments to the world

"MEN are more particular about the two creases in their trousers," says Mr. Clark, "than any woman is about the plaiting of an entire skirt.

"Cigarettes and burned matches cause the most boles in men's suits. Moth holes come next. Battery acid from radio outfits is a close third.

'Every time I see a man resting his clow on the counter at a soda fountain I want to ask him if he knows the risk he is running of running his sleeve.

"You can't tell a man's occupation from the suits he sends us. Judging from the appearance of the clothes we get now and then from some prosperous business men, they might be hod carriers.

"Chewing gum, malted milk, condensed milk, ice cream, indelible ink, road oil, perfumes, battery acid, lipstick and rouge these are leaving the finger prints of the twentieth century on our clothing."

actor lifted them out, he said he couldn't use them. They were immaculate, but were not absolutely smooth where they had necessarily been folded in the package! Merely hanging them up would have remedied thus, but he needed them for a set that afternoon, and the camera

photographs every smallest hollow and purker. Well, we took the suits back, resmoothed them, and delivered them that afternoon over the arms of uniformed boys from the movie studio.

PEOPLE speak of the dry-cleaning industry as a laundering business. More exactly, I think, it is a chemical The removal of business, stains from clothing requires not only a knowledge of chemistry, but the equipment of a miniature laboratory. Our mer customers appreciate this fat more than women. They seldom attempt to remove stains themselves, but women almost niways do, to the despair of our spotting department when the garment is finally brought to us.

For example, a woman the other day brought us a milk drem, pointing out a yellowish stain, which we later found impossible to remove entirely. She said she first had tried a solution of exalic acid on a stain and, when this failed, had resorted to permangulate, without rinsing the exalic acid from the fabric. Women who are otherwise of a cautious temperament seem to take the widest chances when it comes to saving a dry-cleaner's bill,

IF THEY could see the mod- ern equipment of the stainremoving department in a dry-cleaning plant, they would besitate before taking even a grease stain out of a tablecloth! We call the man whose job it is to remove stains, the "spotter." The spotter's tools range all the way from an air gun to a card-index drawer holding stain-removing formulas. His stock chemicals, such se chloroform, scrtic serd, ammonia, alcohol, bensul, and so on, stand within reach. So does another collection of prepared mixtures and solvents. Other parts of his equipment are

A spotting bowl on a swinging arm, for stains that are removed best by stretching the fabric over the bowl and pouring a cleanser on the material

A vacuum tool that the apotter places underneath the stain, to draw off the solvent or water applied from above.

An atomizer of aprayer that may be operated by air pressure from a compressed-air tank.

A blower for quick drying

A swinging aleeve board for working on aleeves, and, of course, a small sink.

HOW do people get holes in their clothes? Cigarettes and hurned matches cause the most holes in men's

suits. Moth beles come next. It is interesting to study these holes under a microscope, for the fibers then show up broken in a characteristic way, according to the cause of the hole. For example, pure silk, when burned with a cigarette, swells and forms a bead of char, easily distinguished under the microscope.

People usually are not care themselves what caused holes in their clothes. When there is any question, we use not only the interoscope, but also the litmus-paper test to determine the cause

For example, a woman came in the other day, much excited because her husband's suit came back from dry cleaning with three little hales in the back of the coat. Bhe kept saying she was sure we had used corrective

"chemicals" on a perfectly good coat.

We took the cost to the spotting table and dampened the margin of the hole. We then pressed a piece of litmus paper to the dampened cloth. If acid had been

present, the paper would have turned red, but it didn't. Then we pressed on a piece of red litmus paper—if the damage had been due to an alkali, the paper would have turned blus. But neither test gave a chemical reaction. So we examined the fabric under the magnifying glass. This disclosed a thin film, a snow-white, gausslike structure, all about the hole, such as is formed by the attachment of a encoon or some insect.

WE TOLD this to our woman customer, and she finally admitted that her house had been infested with moths last summer, and that she really hadn't examined the coat carefully before

Men who have radio outits at home are close runners up to moths, in the damage they do to the family wardrobe. A little battery acid on your hand and a light touch on a dress or cost, and a hole is almost certain to appear sooner or later, depending on the kind of fabric.

Battery seid is sulphuric acid, and thanks to the popularity of radio, it is one of the most destructive agents now causing trouble to the careful dry cleaner. The action of the acid may not be detected for weeks or months. Then, when the garment is sent to the dry cleaner and cleaned, a piece of the fabric, carbonized by the slow but deadly action of the acid, drops out. There is absolutely no way that the cleaner, prior to the acid dent, can know that the garment had been exposed to this destructive element, if the customer himself does not give this information.

Most people are amazed, too, to learn the number of other corrosive acids, salts, and alkalies commonly used around their own homes. The cuticle remover a



How Stains Are Removed

The "spotting" table most improved when the equipment for removing stand from clothing is in really a manusture chemical laboratory. The "spotter's tools range all the way from most gun and vacuum cleaner driven by motor to a card vacies drawer holding faturelias for stand reasonal. Stack obequents, mustures, and solvents stand within his reach

woman uses in manicuring looks colorless and harmless enough, but I have seen a skirt that once had been splashed with it become eventually peppered with holes. The metal polishes, ink eradicators, and shoe cleaners in your home may contain oralic acid, which puts holes in plant fiber and weighted silk when dried on the fabric. Corn and wart removers usually contain acids corrosive to fabrics.

Every time I see a man at a soda fountain spill soda on his coat, I want to tell him to wash it right out with water, even though it is apparently hidden in the fabric. Soda-fountain drinks often owe their flavor partly to seids that cause holes long after you have forgotten having spilled anything. Often these stains do not eat the fabric until heat is applied, which explains why holes sometimes appear in steaming, drying, and pressing.

The other day we received from a woman a fine bedspread, worth about \$150. It was linen, embroidered with colored wool. In laundering, the color had run from the woo! into the linen, and our job was to take out the color that had run. Our first step was to set the color of the wool. We then immersed the spread in a plant scap-and-water bath, swishing it gently around when immediately several large pieces dropped out of the fabric, leaving great holes. Nothing in the water bath could have caused this. What had happened was that in some previous attempt to remove the stance an acid, probably sulphuric, had

> been used and left in the fabric, to do its corroding work unnoticed

That same week we received from a hotel an Oriental rug. Upon examination, we found it contained a large bole, more than a foot in diameter. We thought it might have been caused by the battery acid from a radio set. On calling up the hotel, however, we learned that a tea table had been standing for more than a year over that particular spot. The combination of ten and augur. spilled on the rug, had clowly exten away a hole that took our Armenian weaver neveral days to mer d

People often ask me if we can't tell a man a occupation from the clothes he sends us. Well, Mark Twain sent us his famous white suits at the rate of one a week, winter and summer, year after year. He wouldn't tolerate the smallest spot. If a drop of mud aplashed on his trousers—off to the dry cleaner with the whole suit!

But that doesn't prove that all of our white-suit customers are Mark Twains, or even writers

On the contrary, the remarkable thing to me is that you con't tell a man's occupation from the suits he sends us. We find business men, as a class, the most particular about their clothes. On the other hand, judging from the appearance of the clothes we get now and then from some prosperous business men, they might be had carriers!

A DETECTIVE, perhaps, might make a pretty close guess at your occupation from the corroding materials traced on your clothes. If you are in the automobile repairing or manufacturing business, you are probably in daily contact with the sulphuric acid in storage batteries; the caustic soda in nickel iron batteries, soldering fluxes (hydrochloric acid) and so on

If you are a barber, you play around with adver attrate for antiseptic, and alum and ferric chloride to stop bleeding. If you have anything at all to do with

ge einfanmen um page affag.

Another Eclipse—What It May Tell Us

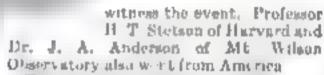
By Newton Burke

January presented to thousands of us the opportunity of witnessing a spectacle whose awe-inspiring splendor we shall never forget. Darkness creeping over the snow; weird, flickering shadows that appeared from nowhere, the dazzling sun gradually obscured until at a breathess moment the greenish gold corons lesped from the rim—thess are the memories of a lifetime.

On January twenty-fourth next, early in the morning, the tremendous scene of a total solar eclipse is to be repeated, but this time for a select little group of scientists who await it in the jungles of far-off Sumatra and Borneo. But because the last eclipse was witnessed by the largest number of persons that ever observed one of those rare celestial phenomena, the coming eclipse is awaited

with larger and keener interest, possibly than any previous eclipse. What new things will be learned about the sun, the moon, the earth, the universe?

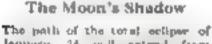
Scientists from all parts of the world now are gathering in Sumatra, Dutch East Indies, and Borneo, where the eclipse's path is undest and where totality will last three minutes and 10 seconds. Dr. Heber D. Curtis, of the Allegheny Observatory, and Prof. John A. Miller, director of the Sproul Observatory at Swarthmore College, set out last September on their journey half around the world to



Thousands of doe are have been spert in the transportation and setting up of acceptatic equipment, all on a gamble, for always there is the possibility that clouds will intervene and make all the preparations valueless

Starting at dawn, local mean time, the path of the eclipse shadow will range from a point in Central Africa, south of the Sudan and north of Lake Victoria, along the equator, across the Indian Ocean to south Sumatra, thence to Borneo and Mindanao in the Philippine Islands. Radio will keep you informed of its progress as it sweeps over these distant regions at a cannon-ball speed of 1385 miles an hour. The total eclipse is due to arrive in Sumatra at approximately 2.25, local mean time. There the shadow of the moon will have a width of 89 miles. The eclipse will last two hours and two minutes.

IN THIS brief flash of time, while the moon passes between earth and min, blotting the latter from view, the scientists will attempt to add a few more details to our understanding of the universe. For one thing, they will try to measure the light of the corona. An attempt to do this at Harvard University last year failed. The observers also may be able to determ he the edge of the moon's shadow path on the earth. This mercation involves the problem of the exact distance of the sun from the earth. If we could establish this distance, then man could measure all celestial distances.



Interpretable of the total eclipse of January 24 will extend from Africa to the Phi picture Intends, The black partial of the band. It index were expresented the up beautiful at the high beautiful at the per armine or partial abidow.



Is Your Memory Really Bad or Just Badly Managed?

Most of us are too lazy to remember properly, says an expert— Useful tricks for recalling names, faces, and telephone numbers—Why a young man usually has a better memory than his father—A dozen ways to test yourself

By Robert S. Woodworth, Ph.D.

NE day recently a young man came to me discouraged.

"I simply haven't any memory," he complained. "I never seem to be able to remember a thing I read."

"Perhaps you haven't given your memory a chance," I suggested. "Suppose we test it."

I tried him with numbers. To his surprise he found that he could remember nine numbers repeated to him successively, and even repeat seven backward. He learned to repeat a stansa of poetry in a full minute less than it took the average person, and in other tests be secred high

The fault clearly was not in his memory, but in the way he used it. He had been in the habit of reading passively without thinking while reading, without analyzing the important parts. He had given his

brain nothing to remember

Many persons are like that, for recent paychological tests have resulted in the surprising but encouraging conclusion that most of us have more memory power than we realize. In other words, if you forget easily, the chances are that the trouble is not your memory, but the way you man-

Dr Woodworth is Professor of Psychology at Columbia University and former Chairman, Division of Anthropology and Psychology, National Research Council



Can You Remember Pictures?

Study there 25 forms for one minute. Then turn in page 149, where you will find a group of 50 forms, among which there 25 are hadren. Check each of the forms that you remember according yourself one point for each one that you check currectly and defacting one point for each that you mark teroog. If you systember 2 out of the 25, it is a good excre-

age it. And you can improve your memrry immensely by improving its management.

The memory process involves three steps: (1) Forming connections in the brain, (2) Retaining these, and (3) Putting them into activity again when occasion arises.

Most persons who try to improve their memories believe that if they could retain facts, they would be all right. The truth is that no one can do much about this middle step. Your power there depends almost entirely upon your physical makeup.

Some brains are more plastic than others, and impressions remain longer in these than in others

Things begin to stick in the brain efter three years of age, and from then up to 20 years the power of retention grows. From then to about 40 it remains the same, after which it diminishes. A man at 50 may seem to possess a better memory than the man of 20, but this is due probably to better judgment and organization of material than actual power of retention.

I know an old retired army officer who can sit for hours telling of his experiences in the Civil War. "What a remarkable memory?" his bearers exclaus. As a matter of fact, his feat is due to the reason

that his memory has become poorer and be can remember nothing new. Daily events make so little impression on his brain, which is more or less rigid, that the early impressions are thrown into high relief

About the only way you can improve this power of retention is through general hygiene, which keeps your brain in good condition. Intoxicants and illness often weaken brain connections. But if you have good bealth and take care of yourself, you need not worry about retaining the connections. The important place to concentrate in improving your memory is in establishing the connections well by getting things into your head in a connected way. It is because of this that you can succeed if you deliberately set out to improve your memory.

First, however, it should be noted that improvement will come not in general memory power, but in special flexis. Psychologists, after testing the memories of many people, any that training does not improve the general faculty of memory, but simply increases the ability to do a particular kind of memory job. If you want to remember faces, you must

Try This ---

EACH of the numbers inted below has one more digit than the preceding one. Have tome use read the numbers aloud to you, one at a time, allowing an interval of one accord between each digit. After each complete line is read, you see to repeat it from memory as best you can. See how many you can remember correctly. Eight is a good score. More than 11 is highly exceptional.

```
6 7

3 4 9

5 1 2 7

8 4 5 8 3

9 2 2 6 1 7

4 3 6 8 2 7 3

1 7 8 7 3 3 4 6

9 2 5 1 3 2 7 6 4

8 4 3 5 6 1 5 2 9 7

2 5 9 1 7 6 8 6 4 9 5

7 3 2 8 4 6 1 9 5 7 3 8
```

---and This

BELOW are 10 sets of paired words. Read them over, associating each of the words in your mind with the opposite one with which it is paired. Now turn to page 149, where you will find the first words of the pairs listed in a different order. Opposite each write down its associate. After one reading you should be able to remember four or five of the associates; after two readings, seven, and after three readings, eight or nine.

| freeze | design. |
|------------|------------|
| expensive. | snake |
| table | lightning |
| overcoat | purpose |
| parlor | atretch |
| prefer. | instrument |
| tiger . | music |
| unfair | smoke |
| fish | guilty |
| aickness | unseen |
| | |

practise remembering faces. If it is telephone numbers, practise remembering them. It is dates, practise You won't dates. ta remember learn names by practising on numbers.

This gives a hint of the first auggestion I make-that is, to improve your general background in the special field in which you want to improve your memory.

MUSICIANS have performed axtraordinary feats of memory in their particular field. Mozart, after lustening once to the chair in the Sisting Chapel anging music not available in print, went home and wrote the whole thing from memory. This amaging feat has become c assic.

A number of years ago, I attended a performance given by "Band Tom," an old colored pranist who had lost his sight. After his regplay concert he asked any one in the audience to play any composition, saying that he would repeat it immediately afterward. Often, I suppose, this was easy, but the day I heard him there happened to be in the audience a skilled organist, who played a learned piece of his own composition. We watched eagerly to see what would happen.

Hand Tom was a little fussed and in one passage besitated for an instant, but otherwise went straight through the piece. The organist said that he had

done very well

NOW Band Tom had not remembered that compulcated piece note for note. that complicated piece note for note, hut merely put together parts that were familiar to him. Through long study, musicians get to know phrases, succesajons of chords, and harmonies. When the organist played a certain phrase, Blind Tom grasped the idea instantly, To one who had no background of musical training, the feat would have been impossible.

Real-estate brokers seem to have amazing memories. They can tell you instantly about every tract of land for miles around-how much area each has, who's hilding it, how much mortgage there is,

and se on

But when you analyze it, you see that it isn't so much that they learned isolated facts, as that they have a background of general facts about local real estate that fit all cases. They hear, for example, that a certain piece of property is held for \$.5,000, but there is a heavy mortgage. To them this means that the owner has a small equity; that the property could be bought for very little cash. The price likewise gives them an indication of the wise of the truct. All this goes through the real-estate dealer's mind when he hears the price. It is part of his job. He

How Many Objects Can You Remember?



Study this picture circfully for our minute and see how many objects you can find in the room. Then close the book and write down as many of the objects as you remember. If you remember more than 15, your score is good, 20 is excellent

acquires naturally a background of facta without any deliberate effort to remem-

An actor, accustomed to the phraseology of the drama, can learn a long "part" very quickly. His memory seems remarkable, yet he would have just as much difficulty as any one clas in pursuing a course in law, say, or learning the details of a commercial position. An actor who had appeared in several Shakespearence productions could commit to memory passages from an unfamiliar play by the same dramatist in almost the time

A Test of Proverbs

READ these proverbe over once, taking about two seconds for each proverb. Then close the book and write or tell some one as many as you can remember. You should be able to remember at least six. Make hay while the sun shines. All's well that ends well. Elaste trips up its own heels. Enough is as good us a feast. Great hopes make great men. Brave actions never want a trumpet

A broken suck will hold no coen Feast today and last tomorrow. All is not gold that glitters. Pleasing everybody is pleasing

nobody. He who begins many things finishes few

idle folks have the least leisure One hour today is worth two

Wilful waste brings woeful want. New occasions teach new dutles. A stumble may prevent a fall Many hands make light work. No news is good news. Too for east in west Giftu make beggare bold.

Caution is the parent of safety. The aweetest grapes hang high-

Better late than never.

that an ordinary person, or even an actor who had not appeared in the classic drama, would require to read them through intelligently.

REMEMBER learning Spenner's "Faerie Queene." At first it took me 10 or 12 minutes to learn a stanza, but after memoriging 50 stances, I could do one in five minutes. What really was happening was that I was getting used to the author's archaic atyle, Remembering енти симет bесацью I was getting those aids or helps that come from the acquisition of a "background."

If you were trying to memorize the details of a radio circuit. and knew little about radio, it would take you many times as long as it would an engineer

to whom all of the terms and ideas were familiar. All he would have to do would be to group together familiar facts. The actual amount of new learning would be

Probably the most spectacular of memory stunts are done with figures.

There was a man named Ruckle in Germany who could repeat 46 numbers in succession, forward and backward, and perform other naturishing feats. If you examined his history, you noted that he was obsessed with numbers from child-

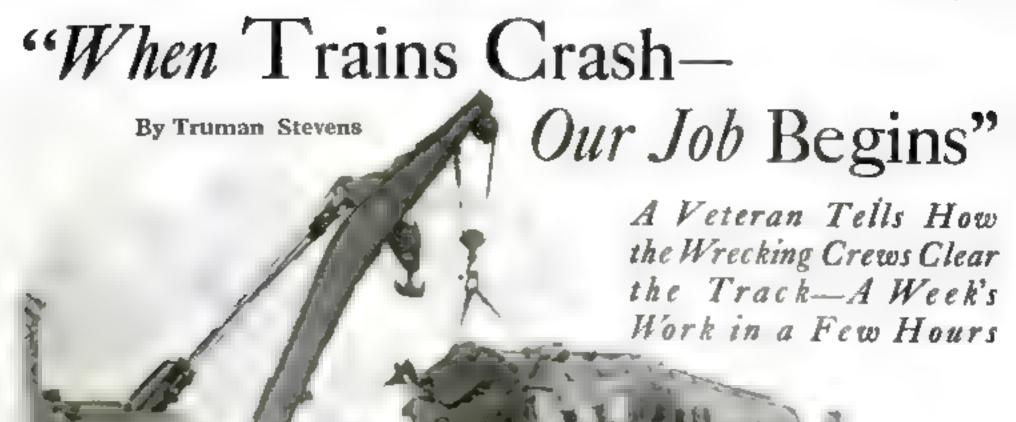
When he saw the combination of 313, he recognized it as a prime number, one that can't be divided evenly by any digit. He knew all the prime numbers up to 1000 they were old friends and to him as familiar as single digits. He knew all the perfect squares, the roots, and so forth Due to his background, he had a vocabulary of numbers of which you and I might be completely ignorant.

F YOU improve your greep of a certain subject, your memory in regard to new details of that subject will improve

You can help yourself in getting the first connections well established by relating facts in large units—the larger the better. Blind Tom, the real estate man, and Ruckle illustrate this. The musician remembered whole passages instead of single notes. The mathematicum remembered figures in combinations of three or larger, and the real-estate man remembered a group of related facts about a certain piece of property. Recalling a single fact in a related group brought all of the facts to mind. So in memorizing, try to link different elements together. If you can see them already bound, it means that much less work for

Interest in a subject helps a great deal in linking facts together. I know boys

(Consente on page 147)



What a Storm Did

In a few hours the wrecking crew closed dway this passenger train wreck caused by a severe storm near Rockport H J. The photograph distant he wrecking every with a wall train coach off a hillside

ARLY one morning several months ago I was riding a sleeper on a flying trip from an Ohio city to New York when I was rudely joited awake by a sudden grinding of brakes and lurching of care as the limited came to a full stop. It so happened that the train had been speeding me to an important engagement in the metropolis that morning; and so, as I peered wide eyed into the darkness, it was with a feeling of dismay, a few moments later, that I heard the word passed down the line that there was a wrock shead.

Two freight trains had collided—a moving coal train bad crashed into a standing one. It was the kind of wreck every trainman dreads; for three of the four tracks of the line literally had been buried by the tangled wreckage of steel "hopper" cars and by piles of coal flung across the right of way by the crash. It was just the kind of a wreck, too, that might doom all my carefully laid plans for the day. Not only was I due in New York at a definite hour that morning, but my schedule gave me only four hours' time to transact my business there and to eatch the only returning train that would take me back to Ohio in time for another and equally important appointment.

When eventually our train was switched over to the only clear track and we crept slowly past the scene of the disaster, the sight revealed by the first break of dawn was far from reassuring. Plowing into the standing coal cars, the locomotive of the moving train had flung itself on end and, breaking from its tender, had burtled against a telegraph pole and keeled over

on its aide. There it lay, a dying monater, gasping and hissing, while a wrecking crew made ready a giant derrick to lift its remains. Here and there hurrying men with flaring torches were cutting away at the tangle of steel cars; others were digging into the scuttered piles of coal.

The work of "clearing away" had started. It was a job, I figured, that would take fully a day, if not two, and it would be 24 hours at least before normal traffic could be resumed on schedule. I gave up all hope of making a return trip that day

Imagine my surprise when, after reaching New York and keeping my business appointment, I learned upon inquiry that the train on which I originally had planned to return would leave on scheduled time! The wreck had occurred shortly before five o'clock in the morning By eight o'clock, only three hours later, all three of the buried tracks had been cleared sufficiently for scores of commuters' trains to pass through! And before noon, when I passed the scene a second time, there remained little evidence of the early morning catastrophe

IT SEEMED the work of magic. That such a tremendous task could have been completed in a few hours so amazed me that at the first opportunity I sought out the freight trainmaster of one of the largest Eastern railway systems to inquire of him the secret of how it was done.

The trainmenter is the man on whom the burden falls whenever there is a wreck to be cleared. His is the job of righing wrecking crews to the scene of disaster at a moment's notice, of directing the work of giant cranes and acetylene torchmen. In his quick-thinking hrain rests the responsibility of restoring normal traffic in the shortest possible time. I found him to be a man of surprisingly quiet voice and manner—a man accustomed to give orders of life-and-death importance calmly, with the assurance that they would be instantly obeyed

"How is it possible," I asked him, "to clear away the wreckage of two steel contrains in three hours?"

"A COAL wreck is the worst kind of a job we have to tackle," he replied 'The only remain we can clean it up so quickly is simply that it wust be done. At this moment thousands of freight cars and passenger coaches are clicking over the rails of our division. Hundreds of thousands of passengers are depending on us to carry them on time to their work and to their homes. Hundreds of cars are transporting coal to beat the homes and office buildings of a great city. Other cars are laden with tons of fruit and other perishable products that might be ruined totally by delay

"Just consider all that the movement of these cars means to the daily life of an immense population; and then think that anywhere, any time, some little mistake, some little piece of mechanism gone wrong, may throw a monkey wrench that will stop every wheel from turning. A towerman may 'daydream' for a brief moment; a switchman may pull a lever at the wrong time, a storm may undermine a single rail. Any one of these

Off the Bridge

A \$50-ton wrecking

crute preparing to

lift a deza jed

freight locomotive

that plunged from

a mairoed bandge

things may paralyze a vast, smoothly running railway system."

The trainmaster paused, recalling, per-

hape, disasters of the past

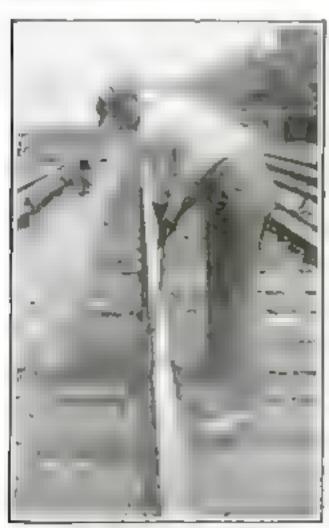
"Whenever trains crash, our job begins, and then it is up to us to get the wheels turning smoothly again. It must be done swiftly, not only because on the resumption of traffic depend the comfort and convenience of thousands of people, but also because every bour of delay may spell tremendous loss to the railway company itself. Consider that a railway must bear the entire loss of perishable stuff such as fruit, if it is delayed and spealed in transit, and you will understand one of the many reasons why speed is so important whenever a wreck occurs."

THE trainmenter's office, I found, like that of the chief dispatcher on the floor below, is an amazingly complicated, yet finely regulated emergency machine, of which the parts are human brains geared to think and act at top speed, with perfect precision, when occasion demands. The clerks go about their ordinary tasks calmly and easily; yet the call for action finds each at his designated post, with a definite duty to perform—a duty that is completed almost auto-

Imagine yourself, some hawling winter night, in the office of the chief dispatcher. A telephone bell rings. Somewhere out in the storm an engineer, scalded and bleeding, has staggered half a mile down the

track to one of the telephones that are placed along the line at intervals of a mile for just such emergencies. It is his voice on the wire. Number 47 is in the ditch—jumped the rade—freman khied—passengers badly hurt—!

The saving of human life comes first. Instantly the call goes out for dectors, numes, and ambulances. Simultaneously



Your Life Depends on Him

The lonely track walker treads miles of railroad ties, tightening boits on the rad points to guard against the chance of decalment. the order is flashed for all trains on the division to stop until the full extent of the wreck can be determined. Officials of the railway, as well as state and Federal commissions must be notified. Already the machinery is in motion for an official inquiry into the cause of the disaster.

This much has been the task of the dispatcher. It has required only a few minutes—perhaps a quarter of an hour Amazing, how swiftly men can move to the work of rescue in such an emergency.



"I remember one passenger-train wreck on a Western road," said the trainmanter. "An express, roaring along at 50 miles an hour, passed a certain block signal where it should have haited. In the signal tower an operator gasped, for he realized that a collision was certain; another train was speeding in the opposite direction on the same track. The operator jumped to the telephone and flashed word to the dispatcher. Doctors, nurses, and ambulances were on the way from the nearest point even before the collision had occurred"

And now, with everything possible done to save human itse and relieve suffering, the enormous task of clearing the rails beging. With the first report of the wreck, the trainmaster's orders have gone out to wrecking crews on duty day and night at several points on the division. In half an hour a fully equipped wreck train, with mighty cranes capable of lifting 100 tons and more, is moving toward the scene of the disaster.

AFTER its arrival, while great me-A chanical arms lift locomotive and steel cars bodily from where they he sprawled across the rails, desperate efforts are in progress to get trathe moving once more. If only two of four tracks are tied up, the problem is comparatively simple, for trains can be operated on the other two. If three tracks are out of commission, the fourth can be used. If four tracks are out, however, some kind of a detour must be arranged. Either a new track must be thrown around the wreck, or trains must be detoured over a branch line or over the line of another соправу

The use of steel cars, while preventing much loss of life and property in wrecks, who must clear the tracks. When the heavy steel becomes crushed and tangled, saws and axes are of little avail. Thus the acetylene torch in recent years has become one of the most important tools of the wrecking crew. Where brake rigging and running parts and bodies of heavy steel cars are mused badly, it saves time simply to burn them

has brought new

problems to the men

apart. Then the cut pieces can be lifted to the side of the track.

THE most effective use of the torch I ever saw," the trainmaster tood me, was when two electric locomotives were wrecked at a tunnel antrance near New York. So tightly were they wedged at the entrance that they had to be cut apart. In the same wreck, the torchmen made a spectacular rescue of a trainman who had been pinned in an upright position in the ventibule of a steel car. In passenger wrecks sometimes the torches do great work in providing a way of escape for imprisoned travelers."

Steel railway equipment, too, has necessitated the development of wreck cranes of tremendous lifting power. In the New York terminal yards of a great railway system not long ago I found a derrick that within a radius of 17 feet will lift a weight of 150 tons, the strain of this weight being counterbalanced by outriggers. Two other derricks each had a capacity of 120 tons.

Thanks to improvements in safety devices, train wrecks are becoming fewer

every year

"But still we have to be ready for them when they come," said the trainmaster. "We have to jump at a moment's notice to haudle anything, from the derailment of one car to a crash that costs many lives and time up an entire division."

"Why do wrecks occur? Well, there are three chief causes—failure of man power, failure of equipment, and arts of nature, such as storms.

"A storm is the one big cause that is

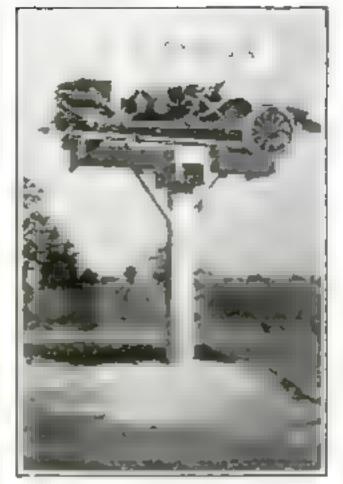
beyond human control. Only a few months ago a frightful derailment occurred in New Jersey because a heavy rainstorm had washed sand across the tracks. Another fatal wreck was caused when a windstorm ripped the top from a freight car and threw it across a passenger track. Floods also are a frequent cause of wrecks that not even the most far-aighted management can guard against."

AS FOR failure of man power and equip-ment, these are recognized as factors that can be controlled and reduced. The raskroads long ago learned that only the man with a clear, healthy mind, free from worry, can be trusted to work under high tension without fear of making a fatal error that might take tremendous toll in life and property. A railroad man who brings domestic troubles to his job is regarded as a menace. By making their men happy and contented, the railroads more and more are endeavoring to prevent costly mental lapses such as that which occurred a few weeks ago on Long laland, when a trainman threw a switch while the wheels of a passenger train were passing over it.

At the same time the railroads are constantly extending the scope of automatic control as a check against human

fullibility

Just this year automatic braking control mechanism was installed on the lines of at least three American radroads. Suppose, for example, that an express train, thundering through the night, passes a block signal. The engineer has collapsed at the throttle. A mile shead on the name track, a freight train in lumbering up a grade. Just when disaster seems certain, there comes a flash of sparks from beneath the front trucks of the locomotive. Miraculously the express begins to slow down—50, 40, 20, then only 20 miles an hour. Now the freight is only half a mile ahead. A grinding of air brazes, an unseen hand closes the throttle, and the express comes to a full stop. A collision has been avoided without the

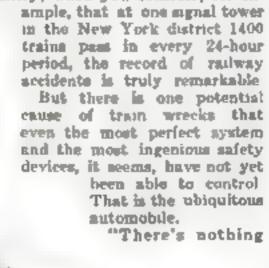


A Leason to Rockless Drivers

How one American railway duplayed a
wracked automobile as an object lesson to
make other drivers think twice before trying
the trick of besting a train at a crossing

touch of human bands. Such is the marvelous operation of the new sutomatic safety control

HOW greatly the perfection of safety devices and the improvement of operating system and personnel have reduced losses from wrecks is evidenced by the records. In 1924, when 931,000,000 passengers were carried—about nine times the entire population of the United States—the fatalities from passenger wrecks were only 149—15 per cent less than the average for the preceding four years. Fewer railway employees were injured than in any year since the records were started in 1888. When you consider the vast network of rail lines that covers the country; when you consider, for ex-



that worries the trainman more than the careless motorist at the grade crossing," said the trainmaster. "It seems almost incredible, yet there have been numerous instances where a stalled car has derailed and wrecked the train that strikes it. Nor is it enough, it seems, to have warning devices and swinging gates at the crossings. I know of one Eastern railroad that reports it has an average of one gate a day broken by motorists who insist on running on the track when the barriers are down."

HOW the careloss motorist is regarded by trainmen was illustrated strikingly following a serious wreck near New York. The automobile that threw the train off the track was buried beneath a tangle of steel freight cars on the edge of an embankment. Just as the members of the wreck crew were about to houst the smashed motor to one of the flat cars that carried the train wreckage, the division superintendent interfered.

"Hold on, boys," he said. "Just leave that auto where it is, as a warning to other drivers."

So the wrecked car was mounted on a pedestal at the crowing where every passing material could view it

In late years the careful investigation and determination of the cause of every wreck has been effective in preventing similar accidents. The old "cause unknown" no longer is accepted by the public nor by public commissions.

Very often the search for the cause is extremely difficult. An investigation committee will work for days at the acene of a wreck, but in the end they find a "lead" that brings a solution.

"IN ONE pushing case a train hauled by an electric locomotive had crashed into a passenger train, killing several persons," said the trainmaster, "The motorman claimed the air-braking system was defective. To find out whether he was right, a device known as the angle cock, which was believed to have caused the trouble, was taken from the wreck and installed on a dummy train. Here it was operated to determine whether its condit on would cause an interruption in the air system. The test proved that the motorman's contention was right. Incidentally it led to improvements designed to prevent further accidents of the same nature."

So it is that the very men who are on the job when disaster comes, to sweep away the wreckage and set the wheels of traffic again in motion, are equally vigilant to guard against the need of a wreck crew. These men are vital parts of a marvelously keep system that today makes it comparatively sale for you to travel on trains, and that brings the necessities of life to you.

Puliting a locomotive out of a river on the Panama Railway Mechanical arms capable of lifting 100 tons and more aid the wreeking crews

who work at top speed to clear the line for traffic

A Heavy Pull

\$1000 More in Cash to Prize-Winners in Our Great "What's Wrong" Contest

Read the Correct Answers and See How Nearly You Were Right

been surrounded by a group of neighbors such as the readers of Popular Science Monthly, never would they have been allowed to make the mistakes they did in their early bungling of jobs around the house. Such keen and astate critics you never met as those who pointed out errors in the third series of eight pictures in our great \$10,000 "What's Wrong" Contest, which appeared in the August issue.

The August contest was remarkable for the fact that the number of contestants who found all the errors correctly was four times as great as for the July contest. Consequently the three judges faced the extremely difficult task of deciding which of the many correct sets of answers were presented in the clearest and most

skuful manner.

After long and careful consideration they decided that the first prize must go to M. Seklemian of Los Angeles, Calif., who with his wife is pictured at the top of this page. Perhaps Mr. Seklemian remembered schoolboy lectures on the worth-whileness of persistence and determination. Anyway, in this case, his

Winner of the \$100 Prize

Until he sees his picture here Wrayburn M.
Benton, of Springfield, Mass. won't know
that he is one of the successful contestants

persistence brought him a reward of \$500 in cash. While working on the August contest he and his wife were camping on the Tioga Road in the high Sierras. The nearest post office was in the Yosemite Valley, 62 miles away. Time for getting in the answers was short. So

getting in the answers was short. So the two set out and made the trip across the mountains, covering the 62 miles to the nearest post office. From there



THE first three prices in the August "What's Wrong" Contest are awarded by the judges as follows:

PIRST PRIZE, \$500 M Sekleman Les Angeles, Calif.

SECOND PRIZE, \$100 Wrayburn M. Benton Springfield, Mass.

THIRD PRIZE, \$50
Joseph H. Glamer
Cleveland, Ohio

Names of winners of the other 65 prizes will be found on next page.

Uncle Sam belped by speeding their entry to New York in an airplane. The answers reached the office of POPULAR SCIENCE MONTHLY just in time.

Mr. Sekleman's descriptions of the matakes made by John and Mary, and of the deliberate errors made by the artist in drawing the pictures, were not only clear and accurate, but they were accompanied by excellent drawings of the Newlyweds doing each of the tasks in the correct way, with the artist's error in each case corrected.

AT THE bottom of the page is the picture of a man who is going to be surprised - Wrayburn M. Benton of Springfield, Mass., winner of the second prize of \$100. Until he opens his January issue of POPULAR SCIENCE MONTHLY, just as you did today, he will not know of



Winner of the \$500 Prize

M Schleman, of Los Angeles Calif., with Mrs.
Schleman. Together they journeyed 62 miles from
their mountain comp to send their winning entry

his success in winning one of the prizes.

When we wrote to Mr. Benton, asking him for his photograph, he was out of town on a business trip. His wife sent the photograph, saying that when he returned she would not mention having received our letter, but instead would let ber husband have the surprise of finding his picture in Popular Science Montrey.

'I want to be there when he sees it," she wrote. "He will be delighted."

Looking at Mr. Benton, would you suspect that he was a poet? We don't know whether he writes poetry for a living (confidentially, we suspect not), but it was through humorous verse that he chose to point out John's mestakes in doing odd jobs about the house.

JOSEPH H. GLASSER of Cleveland, Ohio, wine the third prize of \$50. Just as Mary worked with John in putting up shelves and papering walls, so did Mrs. Glasses help her husband in figuring out the Newlyweds' mistakes.

"My wife and I spent together many interesting, somewhat perplexing evenings at work on the 'What's Wrong' pic-tures," be writes. In preparing their answers this young couple no doubt were aided by their own experiences, for it hasn't been long since they themselves started housekeeping. After putting to bed Joseph Glasser, Junior (a very lmportant individual, aged one year), they got out their copy of Popular Science MONTHLY, and in the home-making struggles of John and Mary, they recognized some of the mustakes they themselves had made. Then Mr. Glasser got out his drawing board and very skilfully showed our artist just how the pictures should have been made. A snapshot of Mr. and Mrs. Glasser appears on the next page.

At the top of page 32 you will find the hames of the winners of the five \$10 prizes, as well as the 60 winners of the \$5 prizes. See if your name is on the list,

Sixty-Five Additional Prize-Winners

FIVE PRIZES-\$10 EACH

Jacob Kleiner, Richmond Hill, N. Y.
Nina E. McLelland, Houston, Tex.
Irene M. Thim, Brooklyn, N. Y.
Mr. and Mrs. Gustave C. Lindquist, Los Angeles, Calif Louise Gardiner Walshe, Jersey City, N. J.

SIXTY PRIZES-\$5 EACH

Fulius E Andersen, Arcadia, Calif W P Armstrong South Gaire Calif Paul J Auxier Omaha, Neb Wm E Barnaby Beverly Hills Calif Edwin F Bramin Balboa Heights, C Z H O Bumann, Sevannah, Ga. J H Coman, Durham, N C. J H Coman, B C Can. Helen Cubertson Hanover Ind.

W S Cunningham, Shreveport La. Schward F Druke Bouth Broad Ind.

Frank M Dugan Utica N Y Mrs. P Arthur Emckado, Scattle Wash, Chia, V Fairchiel Lea Angeles Calif Ed C Fleischman Detroi Mitch Hartand G Poster Brooklys N Y Angus W Oorden Louisville Ky G A Graham, Bashmuse Md Milton A Orave, Evansten III. David F Oray Kanasa City Kan.

C R Greenwild. Columbus Otho
George H Groth. Cleverand Ohio
Otto Alfred Hamen Brooklyn N Y
Water C Harne Brooklyn N Y
Y G Mill Fort Pierce Fin
F P Hodghnaon New York City
W B Hughes Wilmore Ky
John Internation. Rockaway Beach N Y
Mrs. W A Jacobs Mt Vernon, N. Y
A B Kinney Lima Olivo
O B Laurent New Roads Lo.
Jos. P Lessby San Jose Cald
J. O Lipa Louisville Ky
K H Lukenbill Harviburg Fa.
Robert P Lyle R vero Cald
John A Malm Denver Colo.
Mrs. Clyde Mayro Austin. Test
H S. Merritt Los Angeles Cald
Henry J Mayer Jersey City N J.
Nicholas M chel Suphur Springs Test.
Tom H. Muse, Wesburgton, Ind

Bernard Moeddel, St. Bernard, Ohio

E. A. O. Brien, Portage la Prairie, Man,
Can

William Otto Raton Colo.
Orrer V. Overton Janesville, Win.

E. H. Parker Hartford Com.

E. M. Riggs Dos Caberon Arie.
Halleck G. Ranger Indianapolis, Ind.

A. L. Robsham Stockton Calif.
Harrison H. Schley Wankesha, Wis.

H. G. Simmons Kokomo Ind.
Pearl Smith St. Paul Minn.
Harry M. Steed Portamouth Ohio
R. And E. Sidel Clevrand Olio
Mrs. Ivan R. Subblisheld, Cincinnati,
Ohio
Howard H. Birect Attlebreo Man.

L. E. Truebland South Bend, Ind.

Mrs. C. A. Tryon La Bai e. N. Y.
Stephen A. Yetho Washington D. C.
Rogets O. Young Jr. Pawtucket, R. 1

A casual glance at the addresses of the successful contestants will show that they are scattered far and wide through the country

Every one of the thousands of entries in the contest was gone over earefully and the judges based their final decisions on three points—accuracy, clearness, and skill of presentation. Many of the contestants whose answers were presented in excellent form, fell short of winning one of the cash prizes simply because of some slight inaccuracy in their answers.

ONE more month and then all of John's and Mary's troubles will have been solved. If you didn't win a prize this month, there still is a good chance that you may be successful in the September contest; for the results thus far in the \$10,000 Contest have shown that some of those who have been low on the list of

prise-winners one month, or not on the list at all, sometimes have shot surprisingly to the top in another month.

Winners in the September Contest will be announced in next month's issue of Portilar Science Monthly, and the winners of the Grand Prize Contest winners soon after that.

So that you can tell how nearly your own answers were right or wrong, the list of correct answers to the eight pictures in the August Contest are printed below. For each picture you were asked to tell, first, what John or Mary or both were doing wrong and why it was wrong; second, what deliberate mistake the artist made in drawing the picture.

In the following list of correct answers A in each case points out John's error; B is the deliberate mistake made by the artist in drawing the picture.

A pasual glance at the addresses of the AUGUST CONTEST ANSWERS

Picture No. 1. A—John is hanging the acreen door upside down. The smaller section of the acreen abould be at the bottom. B—The artist has drawn the woodplane with cutting blade reversed.

Picture No. 2. A—John has removed the whole faucet. He should have taken out only the valve mechanism. B—The artist has drawn the handle of the rake at a wrong angle with relation to the prongs, and the handle of the hoe at a wrong angle with relation to the blade.

Picture No. 3. A John is making the edge of the board to the plaster of the walf. He should nail a wooden cleat to the wall for the shelf board to rest on. B—The back of the kitchen chair on which Mary is standing has been reversed by the artist.



Winner of the \$50 Prize

Joseph H. Glauser with Mrs. Glauser to front of their home at Cleveland. One. Added by their own recent experiences in home-making they spent many evenings together discovering the mistakes of John and Mary

Picture No. 4. A—John is nating down the impleum as he unrolls it. He should not until it down until he has fitted the whole surface completely, and he should wait at least a day or two until the linoleum lies flat. B—The artist has drawn the calendar to show 80 days for August.

Picture No. 5. A-John is thinning out the paint with water. He should have used turpentine. B-The drain plug for the trap on the kitchen sink pipe is shown on top of the curve instead of at the bottom, where sediment collects.

Picture No. 6. A—In tying the window weight to the new sash cord, John has left too much slack. The weight will strike the bottom of the compartment in which it slides before the sash is completely raised. He should have just enough cord to permit the weight to clear the bottom of the pocket. B—The artist

has placed the sash-lift several inches from the center of the sash.

PICTURE No. 7. A-John is using a 50-cent piece to set the spark plug points. This will set them too far apart. He should use a dime. B—The artist has drawn the blade of the knife so long that it will not close into the handle.

Picture No. 8. A —John is storing the cement on the ground. The dampness of the ground will ruin it. He should store the cement inside or place it on boards and cover with rainproof material. B—The artist has drawn John's shadow too high for any shadow cast by the sun.

The names of prize-winners in the September Contest will be announced in next month's issue, together with correct answers to the eight September Contest pictures. Watch for the February number, on the newsstands January 10.



Tricks in Burning Soft Coal



How to Prevent Gas in Fueling with Soft Coal

Since soft coal produces an immense amount of gas the instant it is added to your fire, it is necessary to keep the drafts closed and the chimney open when filing the furnace in urder to prevent the escape of gas into your home. This photographic diagram shows the proper arrangement of the Vancous furnace openings when feeling to avoid gas ecopes

THEN, last fad, a strike shut down the anthracite coal mines, people who had been accustomed to burn this fuel were thrown into a state of panic. Many probably believed that they were likely to be frozen to death before the end of winter, because the impression prevailed that bituminous or noft coal, the most available substitute for anthracite, is an unsatisfactory fuel for domestic purposes.

As a matter of fact, properly used, noft coal is really just as good a fuel as anthracite and is considerably cheaper. Its only drawbacks are that it is a bit smoky and dirty and requires that more attention be given to the furnace. About 80 per cent of the domestic coal consumers in the United States never see a piece of hard roal from one year's end to another. With soft coal, they keep their houses comfortably warm and even use this fuel successfully for cooking. Many of those who always have burned noft coal, however, probably waste a lot of money each winter just because they fail to handle this fuel properly

While anthracite or hard roal contains only about 10 per cent of volatile motter that can be driven off in the form of gas, soft coal is 30 per cent voletile and in addition contains much tarry, sticky material. When you burn sort coal, then, you must keep in mind the gaseous nature of the material and take steps to insure the combustion of the excess gas.

The first point to remember is that a soft coal fire should not be banked with a large mass of coal shoveled into the furnace at random. Whenever you add wolk coal to the fire, a great quantity of

gas is produced simost at once. Consequently, if you bank the are so thoroughly that the red hot coal is completely buried, the temperature of the top layer will not be high enough to ignite the gas and there is a good chance for an explosion. In banking with soft coal, therefore, you must be careful to pile on the fresh enal in such a way that at least one spot of rad hot coal is left exposed to furnish a flame that will ignite the gen as soon as it in produced.

The second point to remember is that the tarry nature of soft cost causes it to form into lumps and cakes that impede the flow of air through the fire. This means that soft cost requires a good draft. Hence, you will have to keep the druft door open much more than for hard coal. The chimney damper should be open at all times, and it will be necessary to keep closed the door at the back or top of the furnace which, when open, allows air to flow directly into the chimney

WITH hard coal a gentle shaking of the grate twice a day usually in enough to dump all the ashes. With coke the shaking can be even more gentle. Soft coal, though, requires a great deal more attention in this respect. In addition to shaking the grate twice a day, it is necessary to alice the fire two or three times every 24 hours. By "slicing" is meant inserting a long poker in the opening just above the grate sometimes called the "clinker door"-and beaving on it so that the end of the poker will lift up and break the sticky lumps and cakes. If slicing is not done properly and often enough, the draft will be cut off completely and the fire will

In order to supply enough air to burn completery the large amount of gas given of by soft coal, the fire door should be left ajar and the chimney damper should be open. This insures that air will be drawn in through the fire door and prevent the escape of gas into the cellar.

THE most efficient way to test the fire door is to light a match and hold it near the crack in the door. If the flame is drawn into the furnace, you may be

sure that no gas is escaping. Be careful, of course, not to make the match test unless flames appear above the fresh coal. Otherwise the match may ignite the unburned gas and cause an explosion

Many people do not realiza that soft coal can be burned with entire satisfaction in the ordinary kitchen range, provided that the stove is equipped with a grate with reasonably small openings However, if your stove and chimney are not arranged to supply a good draft, noft coal cannot be used.

The rules for burning soft coal in the kitchen range are much the same as for furnaces. Put on small quantities of coal at a time, keep the chimney damper open at all times, do not remove the stove lide, and slow the fire down by lessening the draft. Break up the lumps and cakes with a power at frequent in-

That you shovel fuel on the fire and remove ashes regularly does not necessarily mean that you are getting all the heat out of the fuel even if the bouse is warm enough

For real efficiency, three things are absolutely necessary in burning any kind of fuel, whether hard coal, soft coal, coke, or even wood. You must have air enough, you must have best enough, and the air must be mixed properly with the fuel you are trying to burn. By mixed, I mean that the air must be mixed with the games and in contact with the hot

WITH these facts in mind you are in a position to make an intelligent examination of your own method of caring for your furnace, remembering, of course, that each kind of fuel requires a different treatment and that the size and type of your furnace, together with the chimney arrangements, will affect results

very materially.

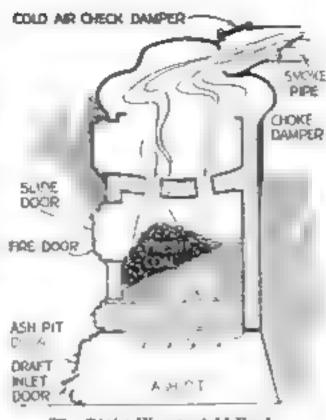
Of all the solid fuels, hard coal or anthracite is the easiest to handle. It is composed largely of pure carbon in a hard, dense form, with only a small percentage of material that can be roasted out of it in the form of gases when it is exposed to heat. Because of this, the average user gets fair efficiency out of hard coal, especially during cold spells when the furnace is being pushed to supply as much heat as possible. With hard coal, the falling off in efficiency occurs mainly when the weather is so mild that it is not necessary to force the fire. To cut down the draft and so reduce the heat of the fire during mild weather, most home owners set the fire door ajar. This permits cold air to flow over the fire in excessive amounts and to cool the furnace without economy of coal.

THERE is likewise a steady loss when a hard coal fire is banked. This is due to the wasted gases that are rossted out of the coal and sent up the chimney without being burned.

When you smell cost gas in your house you are wasting fuel. Most home owners are satisfied if they can adjust their furnaces so that this nozious odor is not detected, but the fact that you cannot smell coal gas in the cellar or upstairs does not mean that it is not being produced in the furnace.

The caroon in the coal unites with the oxygen of the air during the burning process in two different ways. If there is an ample supply of air, the result of the burning is carbon dioxide. When there is not enough air, the oxygen unites with the carbon to form carbon monoxide, a deadly poison. And you can be sure that if you small coal gas in your house, this injurious gas is present.

Fortunatery, coal contains sulphur and



The Right Way to Add Fuel

This erom-sectional view of a furnece illustrates the correct method of forting with northead. The runs is added on in to slope down from the back of the firebox, with live coals exposed in the runs. Without this opening to the live coals, the fresh coal will form into a tarry mass that will extinguish your fire, Keep characy damper slightly open

the sulphur fumes give you warning of the danger, for carbon monoxide in the pure form is entirely odoriese. Coal gas always is produced to some extent whether you use hard coal, soft coal, or coke. It gets out of the furnace and into your cellar when the chimney damper is closed too tightly. This is true even when the fire door and the fire door damper are closed, because the gas will leak out around the cracks in the fire door of the furnace

To MAKE sure that no coal gas comes out of the furnace, always keep the

chimney damper open enough to permit a slight current of air to flow into the furnace through the cracks around the fire door and the chimney damper.

Coke as a fuel for domestic furnaces resembles hard coal in many ways and the home owner who knows how to handle hard coal will have no difficulty in burn-

ing coke

Coke is what is left of soft coal after the volatile matter has been regated out to make gas. The residue is nearly pure carbon in a light, perous form. It burns about twice as freely as anthracite. When burning coke, you can keep the draft door shut practically all the time. The fire door damper should be shut, too, since the gas-free nature of coke moans that no air need be added above the fire to obtain satisfactory combustion. Coke weighs only about half as much for same volume as hard or soft coal, so you must not be sparing of this fuel when you bank the fire at night. Otherwise you may find the fire completely burned out by morning. Put on all the coke you can,

SO THE home owner in a section where anthracite is the regular fuel need have no reason to become panie-stricken over the prospect of a shortage in his favorite form of coal. If there happens to be a strike in the hard-coal mining industry, he can turn to soft coal or coke, keep his home warm, and at the same time cut his coal bill nearly in two!

There is just about as much heat in a ton of soft coal as there is in a ton of anthracite and with a little intelligent study of the simple rules for burning soft coal efficiently, you will find that soft coal makes a very satisfactory fuel. Really, the only disadvantage of soft coal is that it requires more attention and it produces a relatively large amount of smoke. That is the only reason that soft coal is not popular where hard coal can be procured.

A Daily Schedule for the Operation of Your Furnace

BITUMINOUS OR SOFT COAL

Before breakfast:

Open chimney damper. Bhake well, using slice bur to remove clinkers and stir up fire. Add a small amount of coal. Leave fire door open. Ashpit draft should be open.

After breakfast:

Add more coal. Leave fire door open. Adjust ashpit draft as needed.

During the day:

Add coal at least three or four times. After each fixing, the fire door should be left partly open for a short time and then closed somewhat. If coal clinkers badly, grates should be shaken or sliced at least open during the day.

At night

Fire should be shaken down and sliced until it appears bright and clean, with a good red glow in the nampit. Put on plenty of coal. Be sure to leave small red hot spot uncovered. Close subpit draft, partly close chimney damper and leave fire door agar

ANTHRACITE OR HARD COAL

Before breakfast

Open chimney damper Shake fire to remove ashes. Put on fresh cost, just covering fire. Close fire door. Open subpit draft door. Remove ashes.

After breakfastz

Add more coal, check chimney draft, close eshpit draft and regulate chimney damper

During the day:

The smaller the coal, the more frequent the firing. With furnace coal one firing at noon should be sufficient, with another before or after dinner.

At night:

Shake until red glow can be seen in ashpit. Heak fire by using sufficient coal to cover all bright spots until top of fire is entirely black.

COKE

Before breakfast:
Open chimney damper. Do not

shake much, since a coke fire should not be disturbed any more than necessary. Shake just enough to re move sakes. Shovel on as much coke so furnace will hold, and close fire door tight. Open ashpit damper a triffe and regulate chimney damper

After breakfast!

No attention needed at this time,

During the day:

Since roke burns freely, the firing should be frequent, probably as often as with soft coal. Shaking and slicing during the day should not be necessary, unless the coke is of poor grade. The heat regulation should be done entirely with the channey damper

At night:

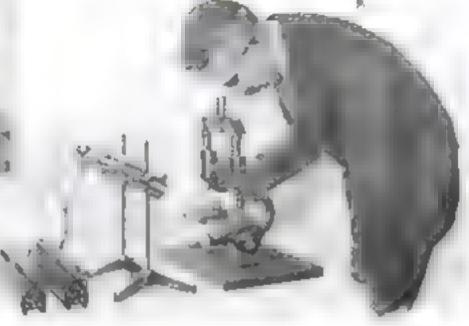
The fire should be well cleaned, since coke does out easily and quickly. In banking, shovel in all the coke you can cram into the door. All dampers should be closed except the channey damper. Keep that open just enough to avoid coal gas in the bouse.



Rending Murder Cines in Con Barrel

Above: John H. Fisher exemplains the serve of elegant to place a serve of the serve





On this and on the following page you will read of discoverers who daily are adding to the sum of human knowledge, and of their most recent contributions to the scientific progress of the world.

Every Gun Leaves Its Mark

prominently in criminal cases will reven! upon their surfaces abnormalities that may have been caused by defects within the barrels through which they have passed. Such a point was at sate in the recent murder trial of Gerald Chapman, and there existed considerable difference of spinion as to the actual causative agent that had produced certain markings on bullets in evidence.

An examination of the gun barrel to settle the matter could have been adequately carried out only by sawing it in two lengthwise, and thus destroying its value as evidence Future questions of this kind are not to be left unanswered, however, for a group of New York arms experts—Charles E. Waite, Major Calvin H. Goddard, Philip O. Gravelle and John H. Fisher—were even then working upon an apparatus that solves the difficulty without the least injury to the arm.

The problem before them was to devise a mechanism that would illuminate any desired area of a putol barrel from 22 caliber upward, and at the same time permit a clear view of the field under examination. A modification of a surgical cystoscope and a graduated circle with vernier attachment added was finally evolved and fulfilled all requirements. Recently they completed this remarkable instrument called a "helizometer," which makes it possible to examine through a microscope every portion of

Through long researches Waste has established the fact that no two rided revolver barrels ever are exactly alike. Although made with exactly the same tools, the minute grooves and elevations made in the riding of the two barrels will, according to Mr. Walte, always mark the bullets fired from the

barrels in such a way that his machine always can identify them beyond question.

In the picture at the top of the page, Fisher is at work examining the interior of a murderer's revolver harrel. At the end of the tube inserted in the barrel is a tiny lens and a microscopically small electric light bulb. With this instrument it is possible to examine the interior of the barrel for flaws that might be reproduced on a bullet fired through it, such as actual defects in the metal, rust patches, lend or other metallic fouling, and to note the effect upon them of repeated firing, cleaning, or other procedures. In addition, it is possible to measure the twist of the rilling most

Flaws in Railway Tracks Recorded

Defects in railroad track can be detected quickly and qually by this new clackwork registering purchine. Installed in a coach it records on a roll of paper all vibrations and jolts when the train is running at high speed. The photograph shows efficials of the London Northeastern Railway of Great Britain testing track with the device accurately. Since no two manufacturers use exactly the same twist, this measurement is important in establishing the source from which the weapon was obtained

In the right hand illustration above Gravelle is seen using the second of the remarkable instruments. This consists, resentially, of two complete microscopes connected by a prismatic arrangement so that the two images can be made to overlap. A built taken from a murder victim is mounted beneath one microscope and a sample built shot from the suspected gun is mounted beneath the other. Strong light is thrown on both builtets in such a way that the infinitely

small scratches and grooves produced by minute irregularities within the barrels are brought into prominent relief. By turning both bullets carefully, it is possible to compare the markings on one bullet with those on the other, and if it is found that they correspond exactly, doubt as to whether the mortal bullet came from the suspect's gun is entirely dispelled.

Cheap Fuel from Dust

If YOU pump cornstarch with air into an inclosed tube and ignite the mixture with an electric apark, it will explode. Recent government experiments have shown in dust great explosive energy going to waste. It is this that is utilized in a new fuel announced recently.

Fuel made from dust or scourings, not only will make use of waste material, but will reduce a big potential fire hazard in manufacturing plants, explains W. A. Noel, an engineer of the Bureau of Chemistry of the Department of Agriculture. It would solve the problem of cheap fuel for factories, he adds, for it may be used in steam or can engines.

Wood, metal, leathers, chemicals, cork, rubber, sugar, grain, eccoa, and cinnamon are but a few of hundreds of products from which the infimmable dust may be obtained. Probably the most powerful of all dusts in that of aluminum, while grain dusts are available in the greatest quantities.

Killer by His Bullets

An Amazing Crime Detector-Other New Discoveries and Inventions

To Silence Riveting Din

HE terrific nerve-wracking din of riveting guns in the construction of steel huildings will be silenced within a few years, according to A. G. Bracil, goneral engineer of the Westinghouse Electric and Manufacturing Company Are welding will replace the rivets.

Welded joints now are used in airplanes and ships, and a few skyscrapers already have been constructed noiselessly. Only a few more steps need be taken, Bissell predicts, before the method will be recognized through the country as not only practical, but as a cheaper and better method of construction.

The workman is equipped with a fiber hood and wears glasses to protect his eyes from the glaring light. A closely woven auit, a leather apron, gauntlets and bellows-tongued shoes protect him from flying incandescent particles. He works in a welding booth inclosed on at least three sides, but with provision for enough ventilation to clear the booth of fumes.

Corsics Floating Eastward

FRENCH officer, Commandant Hel-A PRENOT of the Geodetic Service, who has been making a survey of the island of Corsics, recently made the startling announcement that it was floating away In the last 100 years, he estimates, it has moved enstward a distance of about 33 feet, away from France, its owner.

This curious discovery would fit in with the theories of geologists who suggest that the earth's crust is shifting horizontally. A journalist in Italy suggested humorously that the people of

Corsica would rather be Italuan than French, and therefore are riding toward the land of their preference.

A Substitute for Vaccination

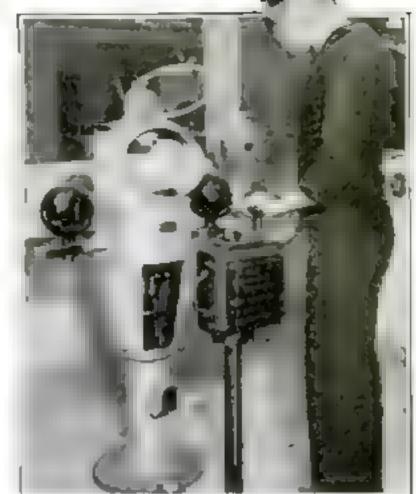
AFTER 27 years of research, Dr. Mervyn Henry Gordon, of the Medical Research Council of Great Britain, has announceed a discovery that in some circles is considered as important as the recent discovery of cancer virus. He claims to have found a way to immunize persons from smallpox and other diseases without vaccination.

Merely by aniffing through the nose a solution of dead germs properly beated, or passing through a room filled with immunizing vapor, it is said, persons will become immune to certain duesace.

Doctor Gordon worked with rabbits. Those "vaccinated" by chemical rays in his laboratory in Berlin. sniffing dead virus, he reports, proved immune to cowper, while others not so protected caught the disease.

Transparent Gold

GOLD of a lacy texture and as trans-parent of glass, an amusing product announced recently, makes one half believe in magic wands. How it is made is kept secret. A German chemut, Dr. Carl Muller, discovered it by chance one day as be was investigating certain



Electric Tiller to Steer Shipe

The most recent improvement ever the time-honored steering wheel for ships is this electric controller, which closely resembles those used on streeteers. A slight turn of the control handle by the believened causes the rudder to respond instantly to whatever direction is wanted

> The new gold in described as a mave of crystals through which light plays as through a thin vell of smoke or vapor. It is said to be 60 times as transparent as the thinnest gold leaf hitherto ob-

> > Photographs may be taken

tainable. through It

The weblike structure of the new metal leaves will be of immense value in the study of atomic structure, the discoverer claims, and will lead to a number of innovations in radio, telephone, phonograph, and other appliances that require delicate membranes or conducting sur-Inces. So little metal is used that real gold may be used for plating instead of gold alloys, making a film that neither fades nor turnishes.



"HENRY, we ought to have a rubber source of our own. Foreign governments could clamp down on us any minute, and where would we be?"

"You're right, Harvey. Why couldn't we get hold of some land and produce some rubber ourselves?"

Some such conversation as this may have been the beginning of the huge project announced recently for supplying the United States with rubber. Harvey Firestone has completed arrangements for a 99-year lesse on a million acres of land in Liberia, Africa, suitable for rubber production, and a plantation of 2000 acres of fully matured plants. He also took a lease on 35,000 acres of land in Mexico.

Then with his friend Henry Ford he quietly acquired huge tracts of land in the Everglades section of Florids and planted many varieties of rubber trees.

He Sends Eight Radio Messages at Once

The remarkable achievement of senicing eight ends messages simultaneously from a single radio transmitting rube, all on the more wave length, and of receiving them all on a single

receiving act, was demonstrated recently by John Hays Hammond, Jr. noted seventor. The picture shows him with his staff of amoutants at Gloncester Mann, operating the instruments

Mechanical Farm Hand Milks Cows

O'Leary's barn, starting the great Chicago fire, would have had no such opportunity under the modern milking conditions made possible on the smallest, most isolated farm by Warren A. Shappert, of Dixon, II., the inventor of a portable milking machine that not only milks the rows, but electrically lights the barn at the same time. It also does a dozen and one other chores about the farm.

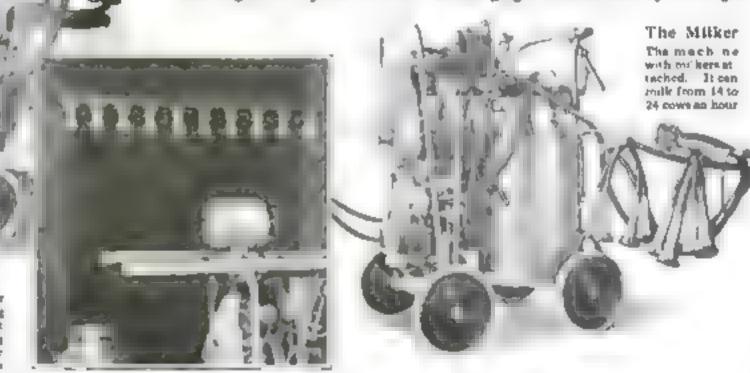
When operated by hand, Shippert's machine can milk one, two, three, or four cows. By means of a

partial vacuum it sucks the milk like a calf. It can be taken anywhere on two wheels like a hand truck. To this hand machine add two wheels, power, and power transmission, and it becomes a power machine operated either by a three-fourths horsepower gasoline engine or by an electric

motor. It then milks from 14 to 24 cows in one hour

Either arrangement, hand or motor, uses an ordinary shipping can sealed from air and dust. Running a pump exhausts the air in the can. A gage registers the vacuum, a relief valve controls it, and pulsators alternate vacuum and relief

Among other chores, the power machine can be used to run the cream separator, pump water from the well for the stock, churn butter, run the grain grinder, drive the grinding wheel for sharpening tools, run the fanning mill, corn sheller, or saturage grinder. The farmer's wife also can use it as a vacuum cleaner to sweep out the house and to supply power for the electrical household apphances. Even after the day's work is completed it is useful in lighting the living-rooms of the farm and in charging the radio battery overnight.



A Machine of All Work

Above Using the portable power machine to grind tools. Note grind not wheel and attachments driven by belt from motor. Right White making the cown the graching also lights the barn, supplying current for 10 house.

Paper, Boards, and Boxes from Waste Lumber

EW uses found for shorts and scraps—the ordinary waste from lumber—promise to save thousands of dollars in the lumber industry Recent experiments in Cloquet, Minn., a little town of forest-fire lame, have found value even in branches and tops of trees—everything down to three inches in thick-

reas. Mile now burning lumber waste under their boilers, it is predicted, soon will look for less valuable fuel

Three new ways have been found to utilize wasts formerly coundered not worth hauling away from the forests. These are the manufacture of a new kind of paper, balsam wood, and artificial boards.

The triumph in paper making was the discovery that popiar and jack pine, thought unsuitable for this purpose, could be used for making bond and other grades of paper. Both kinds of

trees have a natural reproduction, and a sumple forestry scheme, it is claimed, will insure a perpetual supply of raw material for paper mills.

The leftovers from the paper mill in Cloquet are used to make balsam wool, a new fire-resistant insulating material. It can be applied to houses, icenoxes, fireless cookers, refrigerator cars, and many other purposes.

When wood fiber is passed through the screen of a paper mill, a certain knotty substance, known as "rough acreenings," will not go through. This mass of fiber, when used in the manufacture of balance wool, is put through a sulphite process,

fireproofed and ground It is treated to give it adhesion, and finally is brought out in the form of a sheet of light in-

sulating board

Box factories, having discovered a way to cut tongue and grooves on small boards, now are turning to use many boards of sizes too small for piling in lumber yards, that is, material three inches he width or under, and from 12 to 47 inches in length. The boards are glued together to make boxes. A box factory in Cloquet now is using 11,000,000 feet of such shorts.



Boys Build Scenic Railway of Boards

THE Gang was sitting on the steps of Jack Streeter's front porch in Newark, N. J. Summer amusement parks were under discussion. It was a sort of post mortem, for school had begun and trips to the amusement parks would be

lew and far between. Next

aummer was ages away

Three Rides for a Cent_Switches, Too

Most of the gang had gone home to supper. Abe Haman and Wilbur Drikson were still at Jack's house when a brilliant idea struck them Why not build a scenic railway? They could even charge for ridea. Make money. A real business proposition.

The three formed a closed corporation, so to speak, and operations began. They found a wonderful site—a vacant lot with a slope that would make the cars go lickety-split. There were lumber piles around and with judicious explaining maybe you could get planks for nothing.

The boys put supports in the ground and on these laid a track of boards. They fitted the system with switches



Above Collecting fares for their at the bonicmade were railway torce rides for a cent, Left Flency traffic on the line. The numerial track was made of old lumber. Notice the motober and cross-over

the passengers could go over different routes. The cars were made like aleds with wood blocks for runbers that fitted on each side of a guide rail in the center of the times. Each car held two passengers. A braking system also was figured out by these in greens boys.

charge the inventors decided upon. From the first their railway proved profitable. And popular? Jack, Ase, and Wilbur are the most popular boxs in the neighborhood for the rearingement, you know, sometimes

bunds out passes

Model American Home Is Shipped to France

"HOUSES of painted wood? How strange!" or "No servanta! How do you manage!" These are typical remarks of Frenchwomen when American women tell them something of their homes in the United States. Soon they will have a chance to see just what a modern American house looks like

A 10-roum house, considered representative of the typical American home, was erected recently in Brooklyn, N. Y. Then it was dismuntled completely and placed on a ship with its furnishings and equip-

OUSES of painted wood? How ment to be taken to France for exhibition in February at the American Section of do you manage?" These are the International Exhibition of Household remarks of Frenchwomen when Appliances and Labor-Saving Devices.

The two-story shingle house maintains the Colonial atmosphere throughout. The furnishings and decorations are all authentic copies from period pieces. Comfort and livableness in the interior are emphasized. The house is equipped with running hot and cold water, electric lights, gas service, and has every device that modern inventive ingentity has

provided to chase drudgery from the home.

When they all see the rebuilt home, Frenchwomen will be astonished by the amount of household work that can be done by pressing a button. For vacuum cleaners, washing machines, drying machines, electric from, cookers, and refrigerators are unknown to most Frenchwomen.

After the International Exhibition is closed the American Home is to be given to the French citizen who has made the greatest contribution to humanity in recent years.



Maxime Mongendre, French Count General in New York (left), receiving from Arthur Williams, Vice-President of the New York Edwar Company, the large to the Model American home



The model 10-room home as it appeared in Branklyn, MY., before shipment to the Paris International Exhibition. It is of the Colonial style and is fitted with all the most modern electrical applicances, conveniences, and comforts

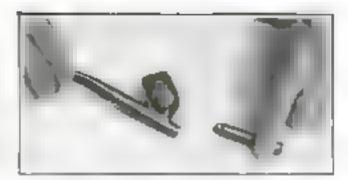
Auto Carries Wire Cutter to Foil Bandits



A German motor car with the sawlike wire-cutting attachment

A WIRE is a lonely country road. The car must stop, Highwaymen leap from the brush on either side, and another hold-up is perpetrated.

So frequent has become the use of wires in robberies in Germany that a novel sawlike wire cutter has been devised. Attached to the front of an automobile, it is said to be successful in cutting the strongest strand.



Curious Pipe Devised for a Clean, Sweet Smoke

FROM the land of pipes comes another ingenious idea to keep your smoke clean and coul. A British inventor has made a new pipe with a trap for picotine. The pipe stem is clongated, running past the bottom of the bowl. Fitting to this is a small metal tube perforated at the bottom and covered with a wooden tube.

A tubular chamber screws into the bottom of the wooden tube and into this chamber flows all the nicotine and saliva. Because it is kept so far away from the pipe bowl, the nicotine, it is claimed, cannot be drawn into the mouth, for it would have to traverse the length of the small metal tube and be drawn through the small perforations.

A Keyboard for Kettle Drums Plays Eight of Them

IN SPITE of his amazing dexterity, the kettle-drum player in an orchestra needs even more agility to play all that is demanded of him in modern music scores. Professor Schneller, a hoted kettle-drum player of the Vienna Philharmonic Orchestra, is coming to his rescue with a kettle-drum plano that will operate eight drums of varying pitch.

Even the most modern orchestras have at most four kettle drums. With a piano keyboard arrangement, the work of the drummer, it is claimed, would be lessened greatly. But would not the admiration of the audience also disappear?

New Gas Manufactured

MANUFACTURED gas that is said to give twice the heat and light value of any gas now used, was announced recently by Col. E. E. Garrison, president of a New York gas company. It is made by vaporizing the heaviest oils obtainable, including sludge and tar, in a column of superheated steam. It can be produced, it is claimed, at much lower cost than any gas manufactured today.

Know Your Car

.

THE spark plugs in your automobile have but one function
they provide a small gap between two metal surfaces or wires
so that the high voltage current
generated in the spark coil may
jump the gap and, in so doing,
heat the gasoline and air mixture
so that it will ignite. One of the
wires forming the gap must be
insulated completely, otherwise
the current would take an easier
path than that across the gap

To keep your spark plugs on the job, follow these rules

1. Be careful not to strike the plugs with a wrench when you are working on the engine. A slight jar may start a crack in the porcelain that will, later on, short

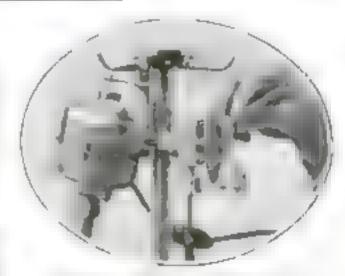
circuit the plug

2. Never screw a cold plug tightly into a hot engine. Wait till the plug has become warm before you give it the final twist with the wrench. Otherwise the plug may set so tightly that you will have trouble getting it out.

3. A.ways clean your plugs when the porcelain core begins to show black from carbon deposits.

4. Never use a sharp knife to scrape off the carbon. You may scratch through the glazed surface of the porcelain and the rough places will collect carbon very rapidly.

5. See that the gap is set about the thickness of a worn dime



Electric Shears Sharpener

DRIVEN by a small electric motor, this new sharpening machine for barber shops will, it is claumed, sharpen a pair of shears in one minute. An adjustable gage holds the edge of the shears against a convex carborundum wheel at the part of the wheel that will assure the correct bevel

cination Institute,

ciarms positive cures

ъ 600 савев.

Taking a Sawmill into the Forest

DISPROPORTIONATE to its oze as the power of this unique plane saw used in the forests of France to topple towering gamta. One of its most interesting features is its portability, which makes it possible literally to carry the sawnull directly into the forest. The cutting is done with a chair of saw teeth When felling trees, thus chain passes around the trunk in a horizontal plane. For cutting the trunks into short lengths later, the chain is used in a vertical plane. A small motor runs the saw. chain is made up of ceparate links, so that : damaged, a section of the chain could be removed quickly and replaced. VACCINATING for rheumatzm is announced from Vienna, Austria, where Dr Gustav Paul, director of the National Vac-

Peliting a tree by motor power with the purtable plane saw



Newest Powder Puff Can Be Cleaned Easily

YOU use a spoon to fill this new powder puff Once filled, the slot through which the powder has been poured is closed so that the puff will not leak.

When the pull is patted, the powder comes out of small perforations in the wool. The chief advantage claimed for this beauty aid, besides being a powder container, is that it has a back of rubber and the wool powdering surface may be washed very easily.

Pests Invade Pine Forests

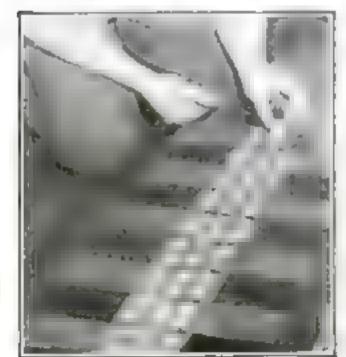
IN THE last few years tens of thousands of American trees—enough to build thousands of homes—have been destroyed through the invasion of the great Pacific forests by the pine beetle, an insect that in less than one year can ruin the mightiest pine tree.

Evidence recently submitted to the U S Senate Committee on Public Lands showed that in a single section of 1,000,000 neres in Klamath County, Oral, lumber destroyed by the peats would have been enough to build not less than 8000 American residences of an average cost of \$12,500 each

White Traffic Lines Made with Porcelain Studs

A NEW idea for making permanent white lines for use at street crossings and for the direction of motor traffic is to be tried out soon in London. White porceisin study are inserted in holes

The study are inserted in a line three abreast, making a strip of white wide enough to be seen easily. The chief advantage of the porcelain is that it is unaffected by weather, oil, or mud, and thus makes a line that cannot be erased by the constant beat of traffic



How the porcelain atude are inserted

Huge "Vacuum Cleaner" Now Unloads Cargoes

ROM the South Sea Islands every year hundreds of tons of copra-dried meat of cocoamuts—are unloaded at the San Francisco docku. A giant "vacuum cleaner, " recently installed, now does the work of unloading, taking the place of a crew of 25 laborers.

It unloads from 30 to 40 tons an hour. With it three men can do the entire job.



Laing a vacuum machine to unload a cargo of copra



Six Pocket Tools Combined in This Cigar Cutter

ONE more curve, one more use. Inventors get real fun out of figuring how, with a few extra edges and odd projections they can give a bit of metal a large number of uses.

The device illustrated above is a sixin-one pocket tool. In the photograph it is being used as a cigar cutter, but it is equally effective, it is claimed, as a hottle opener, acrewdriver caliper, wire cutter, or key ring.

Metallic Substitute for Diamond

AFTER neveral years of research, metallurgical experts of a steel plant at Wetzlar, in southern Germany, claim to have produced a metal alloy nearly as hard as the diamond. The difference in the scale of hardness is merely one-tenth of a degree. The alloy consists of a fused mixture of metallic tungsten and tungsten carbides.

Tests have shown that the tungsten alloy, while somewhat softer than dismond, offers many practical advantages. It is east to have metallic structure and to retain its cutting power much longer than the diamond that has crystalline structure and is extremely brittle, hence soon loses its cutting power by the chipping of its crystal edges.

Criminals Change Their Faces by Plastic Surgery

THROUGH the elever capture in Vermont of a burglar who had his facial appearance altered by surgery, attention was called recently to the increasing use of plastic surgery by criminals seeking to escape identification. On the prisuner was found a receipt for \$450 paid to a New York surgeon for changing the contours of his ears, chin, and nose. He had slyed his balr, too.

How Much Do YOU Know about Science?

THE following 18 queetions were selected from hundreds of queries that come from Popular Science Monthly readers every month. Read them over and see how many of them you can answer. Although the questions have to do with things that we encounter every day, they involve a surprising number of new and interesting facts about the world we live in.

Here's a chance to test your knowledge. After you have answered the questions to the best of your ability, turn to page 150 and see how nearly you were right.

1. When do children grow festest?

Why do onlone make our eyes water?

2. How were precious stones formed in the earth?

4. Why does a gun make a bang when it goes off?

5. What is the carrier wave?

6. Why does frost kill a plant?

7. What is discussible made of?

What is dynamite made of?
 Why do cuts ruffle their hair?

9. Is there any place where things weigh nothing?

10. Why does the earth re-

(1) What was the first animal to live on dry land?

12. Why is it difficult to walk in a straight line when your eyes are closed?

Oddities on Wheels

Some Remarkable Developments in Light Cars and Heavy Buses

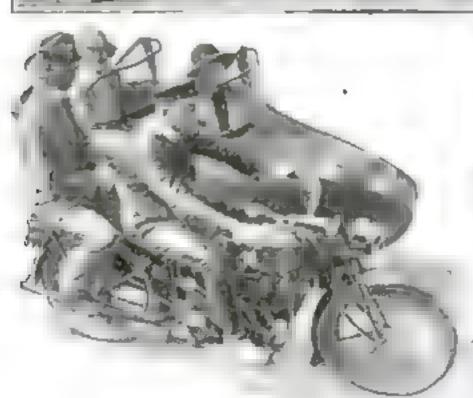


The "cart before the home" idea has been applied in the design of a novel stream. lined passenger car developed in Germany. Seats for the passengers are placed in front, while the engine is

carried at the rear as shown in the ade view below. The boatlike body has a sharply pointed prow, pictured at left, to cut the wind



too perticular about comfort, there secently has been developed thus light three-wheeled cycle car. The atreamlined body is constructed of aluminum



Fire Apparatus Carried on Sidecar

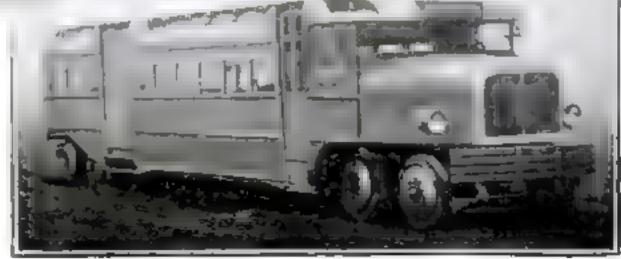
A sidecar fire engine carrying complete fire fighting equipment was a novel exhibit at a recent motorcycle show in London. This compact apparatus was designed for use in rural districts and for fighting forest fires. The equipment includes chemical extinguishers and a pump

Two in Sidecar Tandem

This four-passenger motorcycle carries two in the ridecur. Each of the indecar seats is fitted with a windshield and separate door for entry. The car is streamlined, as illustrated

Eight-Wheel Passenger Bus

A recent remarkable development in overland passenger buses is the hoge eight-wheel gaselectric coach pactured at right. It is driven by a 110-horsepower engine with electric transmission. An ingenious steering mechanism makes it possible for the huge vehicle, 36 feet long, to turn around almost in its length



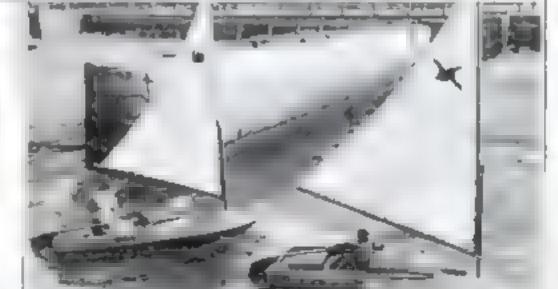
Queer Boats and Their Skippers



Was as Market by the boat the street of the best of th

A Water Bike

Antonio Moreno, movie star, was making a picture on the Riviers, when he became interested in a new sport called water cycling." The photograph shows how rates, the navel machine, a bicycle frame mounted on two pontoons. The pedals drive a paddle wheel at the stern



Stormy Trip in 20-Foot Boats

Frank J. Coyle and Fred S. Dale, engineers, left New York for Florida a short trace age in 20 foot to k b at a tree si diest raft ever to an ortake arch a viviage. Each bont with any and a sail for their venture, Coyle and Dale unacrtook a feat that many believed to be impossible in the winter



Built especially for the shallow waters of equatorial Africa, this compact hydro-glider can earry freight and six peasengers at a speed of 20 miles an hour. Driven by a 200horsepower motor, it furnishes straking contrast to the various types of primitive native craft it passes every day

Canoe Propelled by Feet

In Birmingham, England T Allen, an engineer designed this bicycle cance. The operator lies at the back stild pecials. Allen is shown taking ins sufe on a trial trip





LIKE all the great cities of the world, Paris is faced with the problem of traffic congestion in its chief thoroughfares. Not long ago a test was made of elevated moving indewalks and now the city fathers have decided to install them at busy street crossings

The sidewalk is wide snough to accommodate only one person. It is corrugated, somewhat as an escalator is, to avoid pedestrians' suppling in wet or in

freeking weather

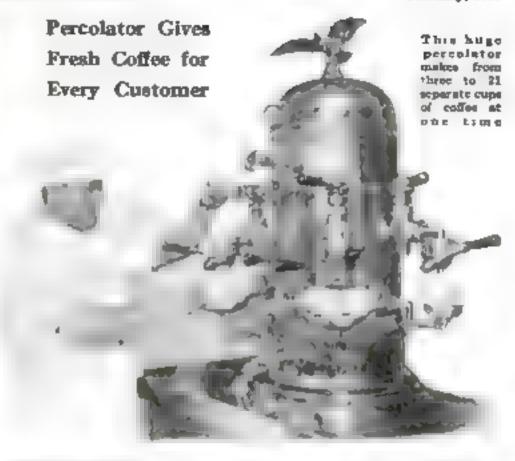


Electric Groover Aids when Installing Weather Strip

A NEW portable electric tool for cutting grooves in wood was designed especially for installing metal weather strips. Only two adjustments are necessary, one for the depth and the other for the location of the groove, after which guides keep the tool in position.

The motor will operate on either elternating or direct current and may be attached to an ordinary electric-light socket. There is a switch in the tool's handle so that the current can be turned on or off without its being necessary for the operator to change his grip.

An Italian soologist, Dr. Filippo Silvestri, went to the Orient in search of parasites to combat the Oriental red scale that has ravaged the orange-groves of California. He discovered three kinds of Insects that feed upon the pest, and is shipping them here by the thousand.



"CHIEF angineer" would seem a more appropriate title than "chef" for the man who operates the intricate looking piece of machinery illustrated. But it is only a coffee percolator of

the latest model for restaurant use and, in spite of its many levers and attachments, it is said to be very simple in operation.

It makes from three to 21 cups of coffee at a time, each order made separately. Warmed-over coffee has no place in the up-to-date restaurant.



A CLEVER builder in St. Paul, Minn., takes advantage of the shrinking property of green wood to build warm, air-insulated houses. Wood logs cut in pieces as long as the wall is to be thick, are laid in the concrete while green. The wall is stucceed on the outside, while the inside is furred and lathed

The wood dries out, leaving air spaces that, besides insulating the house against heat and cold, act as a sound deadener. Where wood is plentiful, this method costs little.



H: w logs are set in the concrete to form an instilu-

Motion-Picture Outfit Weighs only Five Pounds

MANY American travelers abroad last summer brought back with them surprising little motion-picture outfits made in France for amateur photographers. Now these machines are on the market in the United States.

The camera and projector are small enough to be carried in a small handhag,

the combined weight of both machines being only about five pounds. Close-ups of objects in motion can be made at five feet, and pictures may be taken at any dutance without any focus adjustment.

Pictures can be projected on as small an area as the human hand, it is claimed, with perfect visibility. An especially ingenious feature of the projector is an automatic stop that halts the movement of the film while subtitles are being shown. This effects a saving in film footage.









Styles in Industrial Gas Masks

CORRECT proportion, perspective, and all the other hoodson of the would-be artist are conquered, it is claimed, by an ingenious little assistant with double mirrors. The artist looks through the reflector and follows with pencil, pen, or brush what he sees on the paper

By adjusting the position of the reflector the size of the finished drawing may be determined—exact size of the original, enlarged, or reduced. The instrument may be used, also, to teach penmanship. By following what he sees reflected on the paper, a child learns the proper furmation of letters.

Now You Can Call up Your Friends at Sea

"HELLO, when did you leave New York? Saturday? That's the day we sailed from Hamburg. From our positions on the ship chart today, I noticed that your boat and ours are just 100 miles apart."

A scrap of conventation on board the new German liner Berlin, the first ship to be equipped with radio-telephone booths for the use of passengers. They are connected with the ship's radio room, where the sending and receiving apparatus is located, and are operated through a switchboard

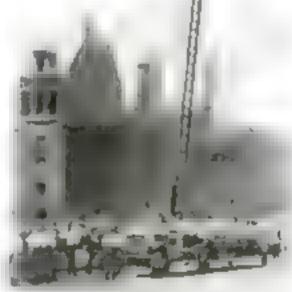
With this radio telephone you can talk to friends on other ships within a radius of a few hundred miles.



Phoning from an ocean liner



Coiling drill is supported by tubing



Atop an 85-Foot Fire Ladder

To ILLUSTRATE spectacularly what could be done with a new 85-foot fire-fighting aerial ladder, it was raised to stand erect, with the fly ladder fully extended. On the extension, towering high above the truck, a nervy man climbed to the top, while the apparatus remained firm, absorbing the strain within itself.

The ladder is raised automatically and is operated on a turntable, which revolves in any direction. Ascrew-operated friction brake locks the turntable at any point.

BECOMING? Far from it. But the young women were willing to hide their faces for a few minutes in order to demonstrate the latest models in respiratory masks.

The one on the left and that in the center are dust masks for use by persons working with emery wheels and in factories where fine powder flux in the air. They

are alike, except that one has a goggle attachment. The one on the right is a gas mask used in places where work is done with acids.

Drill for Making Overhead Holes in Concrete Buildings

As THE use of concrete in building grows the problem of how to drill overhead holes economically has arisen. Thousands of such holes must be drilled to hang shafting, strap electric conduct, run sprinkler lines, and fasten partitions.

A new device recently put on the market, illustrated at the left, emables an electric or pneumatic drill operated by a single workman to be used for this awkward work. The drill is clamped firmly to the upper end of a shaft made of two telescopic pieces of steel tubing. Handles controlling the drill are placed at a convenient working height on the tubing. Power control is provided by running a draw wire from the trigger switch to the handle position and a collapring provides the pressure needed to make the drill

bite in.

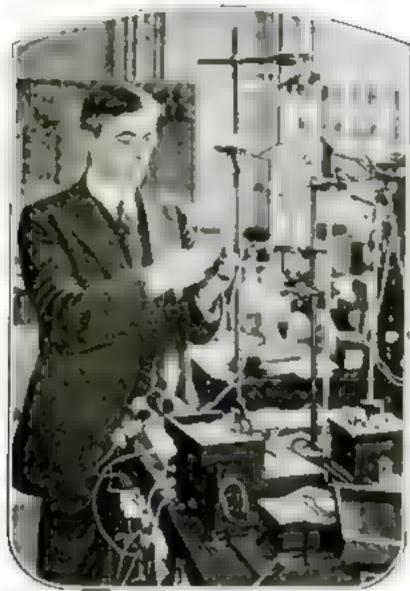
Newcot Micrometer Gives Its User a Direct Reading

NO MORE squinting at the fine graduation lines of a micrometer for the machinist making careful measurements. This micrometer is claimed to give readings of thousandths of an inch, in clear figures. Furthermore, it is of a



size that can be held and operated easily in one hand. The makers say that the dials cannot get out of order.

How Science Is Putting New



Wins Basic Patent on Vacuum Tube

Dr. Irving Language, Assistant Director of the General Electric Research Laboratory. For his invention of the hard type of vacuum tube used extensively for radio and X-ray his company has not been awarded a basic parent after a legal battle lasting a dozen years. It is estimated that more than 10 000 000 tubes embodying his invention are at present in operation throughout the United States

The fure of a new discovery lies in its possibilities for useful applications. So it is that the developments of scientific progress, told in concise form on these pages, bear vitally on the happiness comfort, and success of every man. To read about them will help you to keep wall informed of the world's achievements.

A New Slant on the Weather

"HE birthplace of storms"—that yest frozen sheet covering Greenland's toy mountains—is the ultimate goal of an expedition of adventurers that is being organized this winter under the leadership of Prof W H Hobbs of the University of Michigan, an authority on glaciers and geology.

The party expects to start for Greenland next July, equipped with airplanes for preliminary exploration, with radio apparatus to maintain communication with the outside world, and with scientific apparatus to record pranks of the weather and to observe the movements of the great Greenland glaciers.

One of the chief objects of the expedition will be the establishment of a weather observing station on the vast plateau of ice some 160 miles inland and 7000 feet above sea level. Never before has this been accomplished. At this station Professor Hobbs hopes to maintain a staff of observers for a year to give meteorologists of the world the

A Hunt for the Birthplace of Storms — Marvelous Vacuum Tubes—Inventions that Meet Our Needs

first accurate information concerning weather dusturbances in the part of the world where severe storms are believed to gather. The observations, sent by radio to civilization, are expected to aid greatly in making accurate daily weather forecasts in the United States and Canada.

While the expedition will be under the auspices of the University of Michigan, neveral American governmental bureaus interested in scientific problems of the arctic regions have promised to take part.

A Marvelous Tube

A TUBE so sensitive that it rings a bell when a ring of cigarette smoke floats by, that shricks a warning when the shadow of a burgiar crosses its surface, that measures the light of stars millions of miles away—such a marvelous instrument was exhibited recently by V, K Zwockin, a physicist in the

Westinghouse Electrical Research Labor-

It is a combination of a thermionic tube, one that responds to heat, and a photo-electric cell, which turns light into electricity. The tube looks about the same as an ordinary vacuum tube, but reacts to variations of light falling on it, these variations being converted into surges of electricity that can be converted

into sound. The sounds are amplified a thousand times.

The day when we shall have radio movies is brought much closer, it is claimed, by this unique invention, which is pictured on the opposite page. Other possible uses are in the automatic control of railroad trains and ships.

Noted Inventor Rewarded

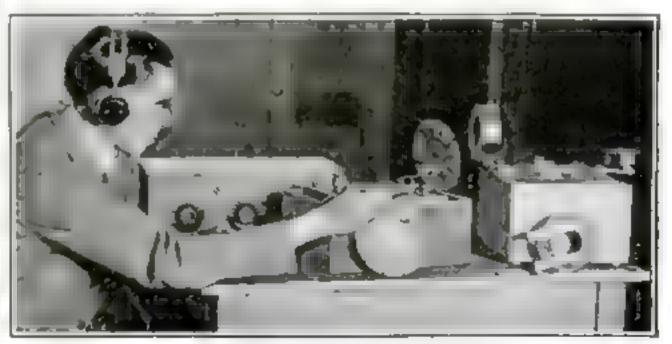
CLOSING a 12 years' legal battle, the United States Patent Office recently awarded the General Electric Company the basic patent rights of the so-called hard type of vacuum tube, used for radio and X-ray purposes. The tube was invented in 1912 by Dr. Irving Langmuir, amutant director of the General Electric Research Laboratory, but because of contests the patent was not granted until this year

It is estimated that more than 10,000,-000 tubes embodying the invention are in operation in the United States.

The tube is characterized by its hard, constant vacuum and its general relability, permitting its manufacture in large sizes operating with more than 50,000 volts, as well as in small sizes such as are employed in the ordinary home radio receiving sets. Prior to this invention, all radio and X-ray tubes were of the type known as "soft." They glowed and acted erratically except on low voltages.

Tasteless Cod Liver Oil

HAVE you any disagreeable recoilections of cod liver oil? If so, you will agree in calling Drs. Harry E. Dubin and Casimir Funk, brochemists of New York, real benefactors. They claim to have removed its bad taste.



Checking Up on the Broadcasting Stations

With about 500 broadcasting stations erouding the other, it has become increasingly important that each station shall keep exactly on the wave length assigned to it by Uncle Sam. To check and measure the frequencies of distant stations. Morris 5. Struck (above) of the Radio Laboratory, Bureau of Standards, has perfected this ingralous instrument—a anet of radio detective

Bunting Pygna-es

by Paging

of utild

Ideas to Use

It was only comparatively recently that scientists discovered why cod liver oil was good for bubies. It is the richest source known of two vitamines, one that preventa rickets in children and another that wards off a serious eye disease that often results in blindness. After this discovery, efforts were begun to make an extract 🕡 the oil that would be easy to take

Not only is the nauseous taste removed in the new extract, it is said, but it contains, in a given quantity, several thousand times as many vitamines as the

original all

New Tunnel for Niagara

THE old Beddell stairway leading down past the "Rock of Ages" and into the Cave of the Winds at Nagara Falls is to be abandoned. A new surterranean passage 200 feet long has been hored through the great chill over who the fals rears connecting with a shaft sunk straight down from the purface of Goat Island.

At the mouth of the shaft is a peninguig named "Clearwater View," which affords a marvelous close-up

view of the falls.

An Improved Headlight

FOR a long time the laboratories of the Westinghouse Electric and Manufacturing Company have been trying to find a good metal reflector. for use in automobile headlights. What they sought was a reflecting material that could be cleaned with gritty waste without



He Weight Human Brains

Ductor Arthur MacDonald, well known goventment psychiatrist, is shown here demonstrating on a fellow scientist how he estimates the weights of a brain of a hying person by Certain measurements. Given the brain weight Dr MacDonald claims he can analyse the mental capacity of any type of individual



Amazing Tube Responds to Light

V. E. Eworkin of the Westinghouse Electrical Research Laboratories, with his assaung new thermionic photo-electric tube designed to convert the power of light into electrical impulses. Physicists declare that the tube transmission of pictures, for it will send out electrical impulses whenever light fails on it

scratching, and be exposed to the weather without ternishing or correding.

Robert J. Piersol, research chemist, announced recently that it had been found. The new reflector has a surface of polmbed chromium, which is extremely hard. A popular reflector for automobile headlights has been silver or nickel plating on a smooth surface, but silver must be coated thickly with lacquer to protect it from the weather, while the reflecting qualities of pickel are not high. Chromlum, it is claimed, has neither of these disadvantages.

Simple Test for Pearls

IN PARIS not long ago a group of the world's greatest pearl merchants watched a French scientist pour gently a handful of pearls into a tube containing what appeared to be water. Some sank to the bottom, but others floated

"Gentlemen," the scientist said, "you will find that the pearls light enough to float in this fluid are natural pearls. Those that sank are cultivated Japanese pearis."

Thus he announced a discovery of great interest to jewel merchants and owners. Hitherto, Japanese pearls, those made by

our fluid can be performed by an amateur, Matches Made Waterproof

examination. The test with the mysteri-

could be dust reguished from natural

pearls only by a complicated X-ray

"NOTHING but moaked matches. We'll have to dry them out before we can have a fire."

This calamity, avoided by the experienced camper or woodsman, who packs his matches carefully in waterproof cases, is often suffered by the amateur. Now Morland M. Dessau has come to their rescue with waterproof matches. They can be dropped into water without spoking them, he claims.

The heads are made of rubber latex mixed with the explosive material, the whole then being vulcanused.

Can We Use Vegetable Fuel?

DOWER from potatoes in Henry Ford's solution for the world's worry about fuel in the future. We can grow our fuel, he said in a recent interview, and convert it into electric energy to heat Dar caties.

Sawdust, apples, weeds-every bit of vegetable matter that can be fermented contains potential fuel. An acre of potatoes in one year will produce enough alcohol to drive the muchinery necessary to cultivate the field for a hundred years, Ford declares.

Among other things, Ford predicts that eventually coal would be burned underground at the mine and sent to consumers in the form of beat and power without ever bringing it to the surface

Unusual Products of Handieraft



Making Animals to Order

A firm in New York City makes mechanical men and animals—anything from a tiny mouse with every joint articulated, to the largest jungle beasts. The picture above shows how an elephant's trunk is built to move like a real one

Shipbuilding in Paper

Two thousand pleres of paper were used by painstaking young Thomas Northrop, a resident of the Panama Canal Zone, in making this sinazingly accurate model of a ship



A young Polish engineer, Alfons S. Riebstaki, designed the submarine pictured above. Instead of the usual framework, its inner shell is composed of 56 cylindrical sections held together by iron rods.

Model of California's Capitol

With a penknife, wood file, hammer, and his hands, John Maguekia, while a patient in a sanitament at Weimer, Calif, fashioned this beautiful little model of California's state Capitol

"Painting the Lily"

By a remarkable new electro-chemical process, Fred Mass, of New York, plates flowers, foliage, and even animal theore with precious metals in such a way that the appearance of the original is retained for a long time



Table Has 6000 Pieces

Six thousand bits of wood are in this inlaid table of well acasened pune, upon which S. M. Perry, of Midian, Kan., has spent spare moments that amount to 11/4 years

lumber three inches thick, is 32 feet

long and three feet square at the

large end. A 50-horsepower electric

motor supplies power for playing

this immense rug could be removed.

It was woven for the Concismati Busi

ness Men's Club, where it covers 920

square feet of floor space. Comparison

with themen will give an idea of its size



Strange Things and Places

Warbling Crickets Are the Canaries of the Orient

ALL the way across the Pacific recently, a tiny cricket sang with a voice as sweet and strong, it is said, as many a feathered bird. It was in a tiny bamboo cage, and came from Yokohama to a family in Seattle, who wanted it for a pet

Both the Chinese and Japanese are fond of crickets for pets. They catch them in midsummer, put them in little cages and hang them in their rooms. The cricket that arrived in Seattle, it is said, sang not by rubbing its wings together, as our black crickets do in this country, but seemed to possess a different and mysterious kind of musical apparatus.

In the Orient there are big insect markets, where the natives buy their strange pets. The illustration at the right shows a Japanese woman in a Tokyo market choosing a cricket.

THE world's highest serial tramway, from 15,000 to 17,000 feet above sea level, more than five miles in length, is used at a Bolivian tin mine.



Elaborate Little Lighthouse Is a Radio Set

In HIS odd hours, Alex Goldstein of New York City

| Second of the secon

The detector unit of a three-tube set is mounted in a glass inclosure at the top of the tower, while a two-stage amplifier is inside. A window forms the bell of the loudspeaker.

A tiny meet and fingstaff support a miniature antenna running to the topof the tower. Around the highthouse yard is a white wooden fence, while in the yard is a realistic dog.



Novel radio set butle to the form of a lighthouse

Realistic Camp-Fire Girl Made of Butter

A CAMP-FIRE girl modeled of butter won first prize for artistic and ornamental display of creamery products at a recent fair in Spokane, Wash. Mose Helen Kane of Spokane, who posed for it, wore the gown, moceasins, and honor beads of a Turch Bearer, the highest rank in the organization.

Howard Fisher, of Portland, Ore., made the statue, which was declared excellent both in its detail and in its general artistic effect.

Bright Colors Mean Little to the Peacock

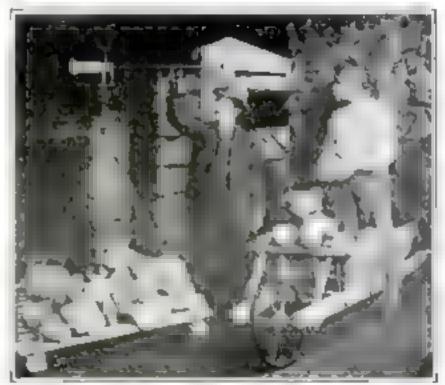
WE MAY be misjudging the peacock and rooster when we call them vain birds. For Dr. H. Erhard, of Munich, who has been experimenting with the symight of birds, says that the shimmering colors in plumage probably mean nothing to the feathered creatures. At least, they do not appreciate colors as we do, if indeed they even distinguish one color from another

Birds that fly by day, Doctor Erhard says, see everything in a bright redorange light, being very slightly sensitive to the short waves that make up blue and violet. Night birds, on the other hand, never see red, but do see blues and violet. Tiny globules of oil in the retina of the eyes art as color screens and determine the birds' color sense, according to Doctor Erhard

Where Roots Are Dug to Make Your Pipes

THESE irregular chunks, resembling lumps of coal, some day will be amoking pipes. They are chunks of briar roots being weighed on the island of Corsica.

White heath, or briarroot, grown extensively in the southern part of France and in Corsica. The coots are dug up, deaned of earth and the decayed parts removed, after which the roots are weighed They then are cut into blocks with circular naws. Cooking these blocks at a low temperature for 12 hours turns them a rich golden-brown color. The briar-root then in ready for shaping into pipes.

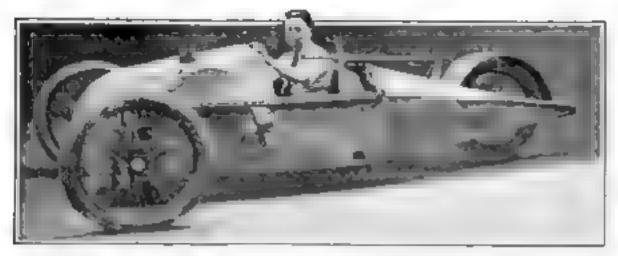


Briar-cook for pipes being weighed for shipment

13 000 lb

elephant standing on four amoli gweebotoen

Seen by a Cameraman



Odd Cycle Car Made from Airplane Parts

OF ALL the strange vehicles seen on the streets of European cities, the one illustrated above is among the oddest. It is a motor car made entirely from spare airplane parts. Roger Ruenot, a Parisian, saw possibilities in the parts for a rueabout and put them together as an experiment.

The car is fitted with a nine-horsepower motor and seats two persons. The body hangs low, barely clearing the ground. The inventor is shown just as he is about to start on a long tour with his unique car

Old Signboard Demonstrates how Paint Resists Weather

THE unfriendly wording of this old painted wooden sign becomes more vivid each year, because during the years the background, unprotected by paint, has weathered away. Microscopic examination showed that rot organisms had not been responsible for this etching Rain and heat alone are responsible for it.

"Weathering" is checking, cracking, aplitting, tearing, swelling, and shrinking of the wood, caused by the alternation of wind and sunshine, and also includes any mechanical wear from wind, rain, frost, or hall. It is not claimed that paint will entirely prevent rotting. Paint is, however, the best known protection against weathering.

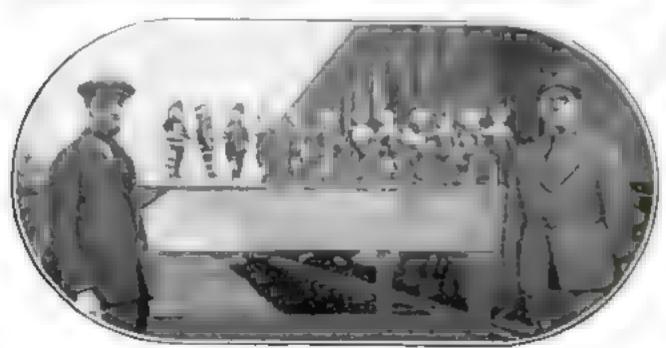


Significant engraved by the weather

Troupe of Traveling Dolls Teaches First Aid

What is probably the only collection of dods ever made by a government agency is traveling in a special car through the United States, domonstrating to mining communities the correct ways for handaging injuries. Some of the dolls have sprained ankies or fractured thighs, some broken arms, while others have their beads generously swathed, suggesting that class of common mine accidents caused by the full of loose rock, plate, or coal upon miners' beads.

The Federal Bureau of Mines considers this demonstration by means of dolis its most effective way of teaching how to apply bandages before the arrival of a physician. The dolls are both masculme and feminine. A number of them are soldier dolls. The engineers and miners who live in the mine-rescue cars, with the dolls for company, naturally have applied picknames to them. Among those seen in the picture are Jiggs, Blondie, Sally Ann, Cap'n Jinks, and Buddie.



How mining communities are taught to give first old to the injured

Huge Elephant's Only Support

TREAD lightly, Babe, and, whatever you do, don't try the Charleston. For Babe, you will see if you look closely, is standing on four empty half-pint bottles. And Babe is no light weight. In fact, he is said to be the largest elephant in the country, tipping the scales at 13,000 pounds.

Balancing on glass isn't one of Babe's ordinary stunts. He did it at the Public Zoo at Toledo, Ohio, recently for the entertainment of visiting glass manufacturers, who beamed when they saw this demonstration of the quality of American manufactured glass. For even under this tremendous weight, not a single bottle was broken.



Radio Set Made Into a Book

ONE of the interesting exhibits at a recent radio show in London, England, is the small volume shown above, which carries between its covers a complete radio set. Its maker, E. R. Fono, bound the book in tortomeshell and entitled it "The Listener"

POPULAR SCIENCE MONTHLY will be glad to answer, wherever possible, all inquiries addressed to its Information Department

On the Wing with the Airmen

Newest Marvels of Aviation



Designs New Motor for Commercial Planes

After seven years of experiment Capt. E. V. Rickenbacker seft, American are during the war, has

just completed this new type of rotary motor for commercia) planes. He is seen demonstrating it to Maj J H. Rudolph, U. S. Army technical expert, at Mitchel Field, N Y Cap-tain Rickenbacker is a leading figure in the development of commercial aviation.



"Foolproof" Passenger Plane Driven by Three Engines

What is claimed to be the nearest approach to a foolproof airplane is this threeengine, 10-passenger Fokker monoplane, which, with angines stalled, refuses to side slip or spin. The upper view shows the arrangement of the three propellers



The latest development in flying boats is this huge allmetal monoplane built by Danish designers for the British Air Ministry. The photograph shows the big boat at Felizziowe, England, after a non-stop flight from Copenhagen. Even the wings are of metal. Notice the two motors mounted high above the fuselage, to escape flooding when boat rides the water



Lieutenant Tate standing on the wing of the plane just before making his remarkable jump

Miniature Planes Compete in Races

Model suple is a lather by if rought nog the laternational Air M et at Methel Field. It has treat in aviation clubs in ad ports of the matry were given a chance to demonstrate to a remarkable roughture machance and to match their skill in flying them. The photograph below above an arm of the entries in the competition



A remarkable device to prevent stalling of a plane in flight has been perfected at Edular Jour Savage more of say welling right, who is seen monstrating the device to C. B. C. lver, skywriting pilot. A miniature wing or vane is attached to a struct near the end of the wing. Ordinarily the vane remains level, but if the nose of the plane points upward at a dangerous angle, the wind flow pushes the vane up, opening a valve. This is connected through relays with a pneumatic device that pushes the control lever forward, warning the pilot of his danger



Bernays Johnson frying an egg over a cake of lee

Some Inventors and

He Fries Eggs on a Cake of Ice

WOULD you believe it possible to fry an egg in a frying-pan held over a cake of ice? To demonstrate that it can be done. Bernays Johnson, well known New York radio engineer and inventor, recently devised the apparatus pictured at the left.

The probable explanation is this: Beneath the table top is concealed a coil of wire through which high frequency current is passed. When the frying-pan us placed in the magnetic field of this coil, an electric current is induced in the iron of the pan, heating it sufficiently to cook an agg At the same time the current has little or no effect on the cake of les resting on the table.



Young Musician Perfects Automatic Page Turner

AFTER seven years of patient experiment, Michael V. Ventrella, a young New York musician, has invented an ingenious pedal device that makes it possible for the musician to turn pages of music without taking his hand from the instrument he is playing. All that is necessary is to step on the pedal that actuates an arrangement of levers that turns the pages of the music automatically.

The device can be applied to a piano as well as to a music stand, the inventor claums, and can be adjusted to turn the pages of a book at any height. When idle it holds the pages flat and firmly on the rack, and so keeps them from blowing in the wind and causing the player to loss his place. It is said to be noiseless

in operation

Talking Motion Pictures Sent by Radio

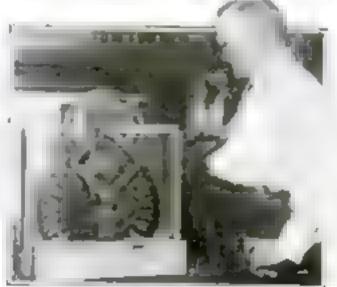
SOME day soon you may alt at home and receive a whole moving-picture show over your radio. Not only that, but the actors actually will talk.

At the right is C. Francis Jenkins, of Washington, D. C., experimenter in radio vision and radio movies, demonstrating the apparatus with which he recently transmitted a motion picture and verbal description of it at the same time.

Foot Toboggans Provide a Novel Winter Sport

PROBABLY every boy has tried sliding on barrel staves or other improvised anowahoes. It was while helping his own boys to build sliders that a Museourt manufacturer hit upon the idea of the foot toboggans pictured below. Resembling sandas, they are strapped to the shoes like skates. The soles are of this corru-





C. Francis Jenkins with saiking movie machine

gated metal, to provide traction on smooth ice, and so make it possible to control movement. They can be used either for skating or coasting.

Guides Amazing Boat by a Beam of Light

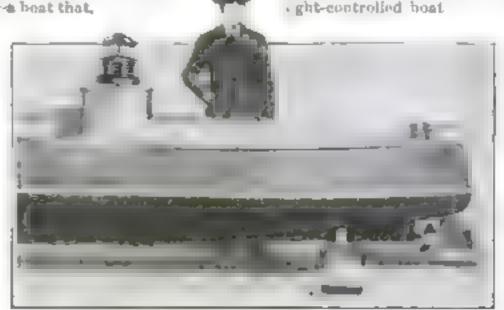
THE well known English inventor, H. Grindell-Matthews, creator of the famous "death-ray" machine, recently announced another startling product of ocientific research -a beat that,

he claims, may be guided from a distance of more than five miles by a beam of light. The beam striking an instrument on the conning tower of the boat, will operate the engine, steer the boat in any direction. the inventor says, and also will fire a small gun. mounted at the stern. For

coastal defense in time of war, such a boat might prove exceedingly effective.

The photograph shows the

rear portion of a model of the



il. Grindell-Matthews beside a model of his light-controlled boat

Their Ingenious Products



Crippled with Rheumatism, He Inventa New Golf Game

HANDICAPPED in his golf game by rheumatic pains that troubled him every time he awang at the ball, N. E. Warwick, of Cleveland, Ohio, refused to give up his favorite aport. Instead, he invented a remarkable new form of golf, in which the ball is hurled with a whipping motion above the head instead of being driven from the ground.

With light, whiplike sticks he now claims he can make a better score than ever before. The heads of the sticks are cups that hold the hall. Warwick has developed three kinds of clubs—the hurler, for the long shots ordinarily made with driver or brassie; the mid-hurler, corresponding to the midiron; and the sinker, corresponding to the putter With the hurler Warwick claims to get more distance than the ordinary golfer gets in the average drive off a tee.

Embossing Machine an Aid to Blind Printers

ONE of the most remarkable publications in the world is the Ziegler Magazine for the Blind, published in New

York City; for it is produced almost entirely by diblind persons. To facilitate the printing of braille type, in which combinations

in which combinations of tangible raised dots represent the letters of the alphabet. Joseph Brusca has movented the machine above at the right. It is used in an improved method of embossing press plates.



Joseph Brusca embessing bradle ferters with bla new much no

The inventors with their "gravity motor"

Canvas "Lap" Gathers Fruit without Bruising

IN ORCHARDS near Portland, Ore., a unique fruit gatherer is being used to catch all of the fruit without brusing it The device, perfected by Arthur Hedder

of Portland, is mounted on wheels like a wheelbarrow

When the tree is shaken, the fruit fails on a sloping sheet of canvas and rolls into an opening in the



The Latest Idea in Perpetual Motion Machines

ANOTHER perpetual motion machine!
Till the end of time men will keep at
it. You can't discourage them.

The undiscouraged inventors in the photograph are W. J. Winkelman (left) and J. K. Deem, of Los Angeles, who claim to have invented the only workable perpetual motion machine offered to the mechanical world. Through a combination of levers, it utilizes the law of gravity, they explain. The inventors believe that gravity motors will make the desert and remote sections of the country habitable by providing self-generating plants for lighting, beating, and bousehold needs.

Revolutionary Steam-Boiler

A STEAM-BOILER of revolutionary design has been produced by a German engineer-inventor, Bernhard Becker. When stripped of its insulation, it is a cubical box only about 18 inches on a aide; but its inventor claims it can produce more than 800 pounds of steam an hour and get up a pressure of 800 pounds to the square inch in five minutes.



Traffic Cop a Semaphore

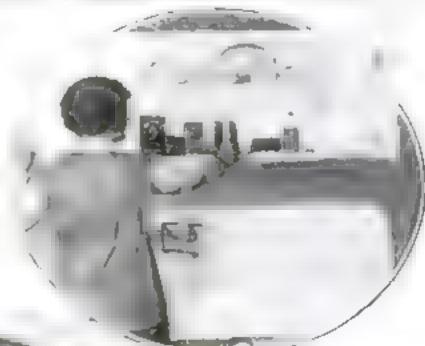
TO SAVE trouble and confusion in regulating traffic, A. Seua, a Malay policeman, carries his own semaphore in the form of light, basket-woven "wings" strapped to his back. Whenever he is ready to change the direction of traffic at a street corner, all he needs to do is to turn his body to give the signal, which no driver can mutake easily.

Sixteen Answers to a

Improved Utensils and Conveniences to Meet the



the ank cabinet that is very handy for all the many small things used in a kitchen. An under the unk table is also used in conjunction with the cabinet. It contains drawers and a compartment for all the kettles



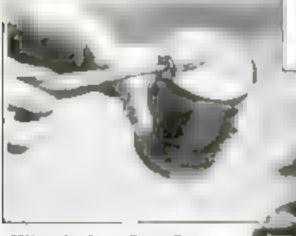
Electric Light Cooks Food

With the heat of ordinary electriclight bulbs it now is possible to cook and bake. This new cooking device is said to reduce the furl bill considerably. Food is put in the container and the current turned on



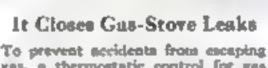
Tiny Manicure Set

Handy for a woman's bag is a manicure set with four tools, carried in a case three inches long. Each tool screwe into the end of the case. The case is made of a non-inflammable occluded substitute, pretify engraved



Wheels Cut Can Open

A pair of shearing wheels does the outting. This can opener uses the principle employed for shearing metal in factories. The shaft on which the wheels turn is pivoted on a punch inserted at the can's center



gas, a thermostatic control for gas appliances has been devised. If for any reason the gas pressure gets low or the gas goes out completely, a rod extending over the gas burner contracts, closing the valve automatically



For Left-Handed Peelers

Considerate of the left-handed housekeeper, a manufacturer has made an adjustable potato peeler that can be fixed to accommodate her. At the right is the device adjusted for left-handed peeling



Handy Milk-Bottle Holder

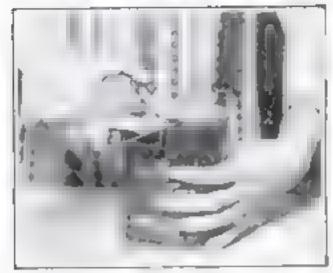
Sally won't come home crying over split milk. Her mother gives her a new milk bottle carrier to take with her to the store. It his over the bottle and provides a convenient handle. It can be used, too, to hang up the milk bottle



More Heat from the Fireplace

The device at the left prevents heat waste by doubling a fire's radiating surface. Fresh air enters through the bearth and bollow andgroup to a distributor behind the fireplace, It flows through flexible copper heating tubes to a register above the fireplace, then out into the room. The equipment is said to work in any fireplace that burns without smoking. The air may be run through a pipe from the outdoors Housewife's Problems

Demands of the Wide-Awake Woman



Opena Cans with Key

This unique can opener has nothing on which the housewife can cut her fingersno lentfe; no sharp edges at all. It clamps on the side of the can and the key is turned to remove the top of the cam

Wax Paper Folds Neatly

With wax paper put up in the convenient form shown below one sheet at a time can be removed without disturbing the rest. The balance goes back in the roll, which is secured by the folded cover and a string



Newest Electric Refrigerator

This electric refrigerator is claumed to be practically silent in operation and to require no atten tion for lubriention. All the refrigeration mechan tem is contained in one unit, set in the brine tank t ar igh the top of the calcact. The unit is suit able to see ral start of hoxes. Comphoard argumeyears an even report many Buce a long of the second of personable in the form of the pick en s. I et gafa from ing or how a sea or class. The easy decided in the shut down the inachine overnight once or twice a month to allow the arcumulated frost in the brine tank to melt away

Folding Crib Saves Space

Do you remember the old-fashioned crib that rolled under the bed? Here is a modern version of it. The mattress and bedding remain on the hed when it us folded. It is a space saver, yet provides plenty of room for a child



Two-in-One Knife

A combination bread knife and spatula serves two needs. It has a razor edge, for cutting bread or meat, while its flexibility makes it a good spatula

When folded, the celb can be pushed camly under a bed

Garments Held Securely

Rubber tips for garment hangers keep the garments from slipping off and falling to the floor. The tips may be moved at will



To Grease the Griddle Pan

A new place of cloth for each griddle grossing may be fastened in this wire bolder. A small pan for the grease is provided

Cherry Pitter Leaves Fruit Whole

This aluminum cherry patter drives the stone out in a moment. leaving the fruit whole. It fits the hand and there is no crushing of the fruit

Coins Sorted and Counted Automatically



Counting machine, showing hopper diled with unsurved coins

FOR business houses where thousands of coins of all denominations must be counted in a day, this ingenious automatic com-sorter and audsting machine has been perfected.

At one end is a hopper into which coins, bills, and checks are emptied. After removing the paper money, the operator simply presses a button to start the machine. In a moment all the coins are sorted automatically, counted accurately, and wrapped.



This Fountain Pen Holds a Supply of Stamps

HOW many times, after writing a letter, have you found yourself without a stamp to send it through the mail? Here is a simple but ingentous device that makes it possible to have a supply of stamps always on hand when you need them-right in your fountain pen. A strip of stamps is wound on a small drum that fits inside the pen.

Loudspeaker to Give Warning of Earthquakes

REMARKABLE instrument that translates the slightest tremore of the earth into sounds that issue from a joudspeaker is the recent invention of a Japanese professor, Dr. Jun Shida of Kyoto University. It is designed to give warning of the approach of earthquakes.

The possible usefulness of the invention lies in the assumption that most severe earthquakes are preceded by slight abooks. Thus, an audible warning of elight tremore would give people time to leave homes and office buildings before the arrival of a destructive quake.

The invention consists of a pendulum. an electric coil, and an amplifier. The pendulum is so delicately poised that it responds to the slightest vibration. When it is set in motion, electricity is generated in the coll, which actuates a soundproducing device. The sound is amplified and issues through a loudepeaker.

Further improvements will make it possible to transmit directly by wireless the sound generated by the first tremer.



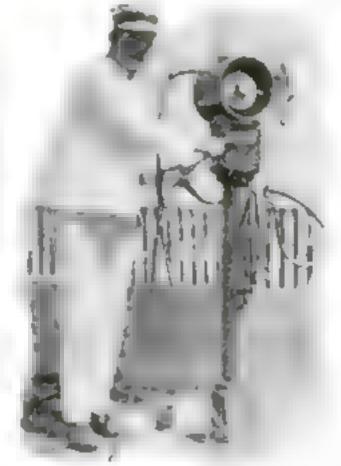
No LONGER is it necessary for the motorist, getting "free air" at the gas station, to disconnect the air hose from the tire valve frequently to test the presaure in the tire.

An automatic air meter is the latest device for the gas station. The motorist sets the dial, shown in the photograph, at the exact pressure he desires in the tires.

When the dial is set, a light, to which the operator is pointing, comes on. All that is necessary now is to attach the hope to the tire. When the tire is filled to the pressure indicated, the light goes off.

Latest Automobile Will Be Driven by Oil Pressure

AN AUTOMOBILE of revolutionary dealgn, driven by oil pressure, is to be manufactured in Lansing, Mich., according to recent reports. Genre, driving shafts, and brakes are to be replaced by oil-pressure pipes.



A light signals the air pressure



A Collar Clasp that Lies Flat on the Neck

ALMOST every man has dreamed of perfecting some kind of a button for the back of the collar that will lie flat without preising against the nape of the peck uncomfortably. The latest idea is this button that is made in the form of a clamp.

When the head of the button is inserted through the holes of the collar hand and coller, a spring hinge maps it tightly against the base. The device may be used also as a tie clasp.

Rod Holder Devised for the Lazy Fisherman

PERHAPS, if you are the kind of fisherman who gets tired of holding a pole hour after hour, you have had the surprising experience of returning to the

left stuck carefully into a mud bank. has been pulled out into the middle of the stream.

For you there has been invented a new rod holder. An 18-inch metal spike is driven into the ground and to thus in attached a clamp that grips the handle of the fishing-rod. rod can be adjusted easily and quickly to various positions, and it is

claimed that it is impossible to pull the rod out by a forward pull. The picture below illustrates how the holder does the fishing while the angler looks on.



The red is hold rightly while the Schermen lights his pipe

This Pencil Writes in Five Different Colors

A POCKET penell that will write in any one of five colors is a new convenience for the office man. It is of the self-feeding type. When a lead of a certain color is to be used, an indicator near the point is turned until it registers the desired color. A twist on a knurled knob at the end of the holder then ejects the lead at the point.

The pencil has a clip to fasten it to the cost pocket.

New Type of Dolly Truck Makes Heavy Work Light

TO FACILITATE the handling of heavy rolls of paper, an Indiana printer has invented the compact but extremely sturdy new type of dolly truck pictured at the right. It has been found equally useful for moving heavy crates, barrols, drums, casks, and other bulky loads

The truck has six wheels. An unusual feature is that the wheels on the center axle are slightly larger than those on the two ends, thus acting as a pivot and permitting tilting. The truck is built low, with projecting skids sloped to within two inches of the floor so that articles can be loaded easily.

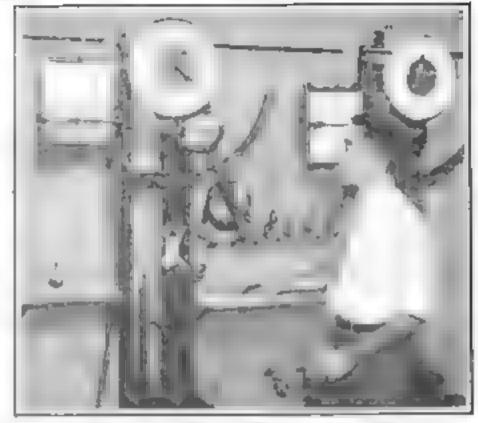
Loads with curved surfaces, such as paper rolls and barrels, that usually have to be blocked to keep them from rolling from the ordinary truck, are held securely by the slanting sides of the truck frame.

Measuring Wear on the Seats of Trousers

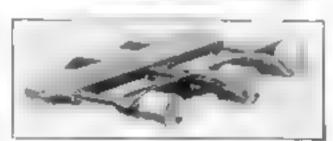
HOW many times can a man sit down without wearing out the next of his trousers?

A definite answer to this really important question now can be obtained in round numbers from a novel textile-texting machine devised by the U.S. Bureau of Standards to measure the durability of cloth used in making army uniforms.

When applied recently to a new quality of cloth for army trousers, it was found that the wearer could sit down 97,000 times before the cloth showed the least sign of wearing through.



W J Stephenson, testile tester of the U S Bureau of Standards, meaning west on trousers sents by the textile-testing machine



The new dolly, loaded and empty

improved Barbed Wire Is Easier to Handle

SHIPPING and putting up ordinary barbed wire takes a great deal of time. The wire tangles easily, and on arcount of the barbs it cannot be wound tightly on speeds. When it comes to stretching it, term bands and clothing so often result that stringing barbed-wire fences is counted one of the mean jobs on a farm.

A new product called "barbed band," eliminates most of those difficulties, for it is collapsible. In other words, its barbs are folded like knife blades for shipment, and show up only when the wire is stretched. The wire consists of strong boop iron punched on both sides, leaving a small barbed band that can be stretched easily.

A ring of about 22 yards of the punched band, weighing about 20 pounds,

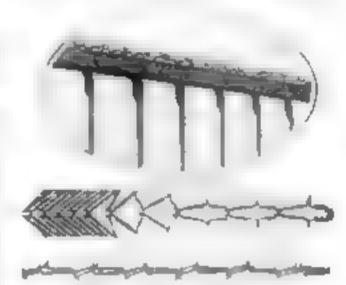
Charcoal Gas New Substitute for Gasoline

THAT charcoal gas can be used effectively as a substitute for gasoline in motor vehicles was demonstrated recently by the French government in a 1500-mile endurance test for cars using this new form of fuel. It was found that a

motor-truck burning charcoal and using the gases of combustion in its cylinders, costs less than one-fourth as much to operate as a similar truck burning gas.

For the use of charcoal gas, no changes in the design and construction of the

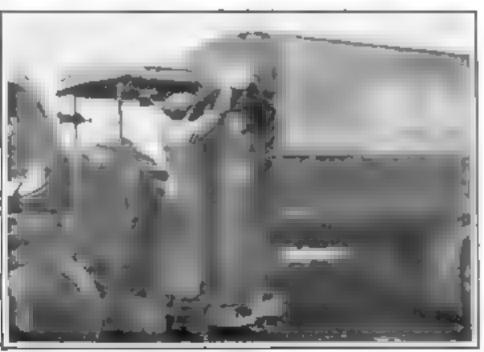
> motor are necessary it is said. The car, however, must carry a wood- or coal-burning furnace, which is fed with charcoal blocks. As the charcoal burns. the gas rises to the top of the furnace, whence it is carned off to the motor There the gas is ignited, much the same as in the gasoline car. and its expansion aupplies the power to drive the piotons of the automobile's engine.



showing no barbs, and taking little room contains more than 127 yards of the barbed wire. The sides of the band are very sharp, giving additional protection.

The band may be used not only for fences, but makes a good substitute for wire grating

THE glarimeter, the only instrument invented for measuring gloss of paper, has just been adopted by the U.S. Government as the legal standard for newsprint,



Filling furnace with charcoal blocks as a substitute for gamling

A Loudspeaker You Can Build

All You Need Is Wrapping Paper, a Chopping Bowl, and a Phonograph Unit to Make It BY ALFRED P. LANE

are pumbers of our readers undoubtedly will be interested in the description of a home-built loudspeaker that is inexpensive, easy to construct, and gives surprisingly good results.

The function of a loudspeaker is to transform the electrical impulses generated in the radio receiver into cound waves in such a way that every slight variation in the slectrical current will be reproduced in the form of sound. It should produce plenty of volume with minimum dustortion. In other words, the music or speech should be clear and loud enough to be heard properly

Judging of loudspeaker quality is excoodingly difficult. The

human sar often conveys to the brain an impression that it has beard certain sounds that may not have been present at all. In addition, the memory of the human brain for what it has heard is extremely short. For this reason, it is next to impossible to judge the relative quality of two loudspeakers if any appreciable time elapses between the bearing of one and the other. That's what makes it so difficult to decide whether your neighbor's loudspeaker sounds better or worse than your own unless you can hoar them alternately on the same receiver.

AFTER all, the true test of a loudapeaker is whether it pleases the man who has to listen to it, and on that basis you are just as good a judge so any one as to whether the loudspeaker you build is a good one or not

All loudspeakers consist, essentially, of two main parts. First there is the electrical mechanism for changing electrical oscillations into mechanical vibrations. Then there is always the part of the apparatus devoted to impressing these mechanical vibrations on the air so that they will be conveyed to your ear. In the electrical and of the loudspeaker, a fine coll of wire in connected with the plate circuit of the last tube in the radio receiver and placed in the instrument where variations in the current flowing through the coll will change the magnetic pull of a permanent magnet. These changes, in turn, move the armature of the magnet back and forth.

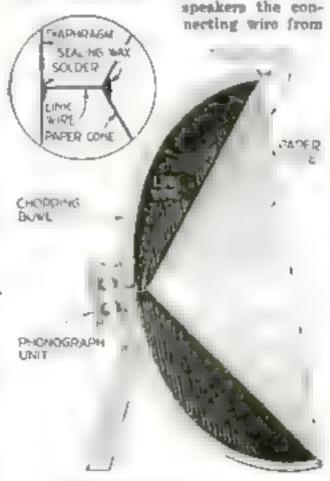
In the simplest forms of loudspeaker,



Clear Reception at Extremely Low Cost

The completed homemade loudspeaker constructed of a wrapping paper cone, a chopping bowl, and a phonograph loudspeaker unit at a cost of only a limited are. You don't have to be an expert mechanic to make a good job of a Note how the paper cone in festened to the rise of the bowl with thumbtacks.

the armature consists of a thin disk of iron, and the vibrations of the iron set up sound waves in the air inside the horn. In others, the armature is a small pleas of iron attached by wire to a mice disphragm. In the cone-type



How the Parts Are Assembled

Constructional details of the loudspeaker. The larger diagram above how the bowl paper cone, and phonograph unit are essembled and connected. The smaller diagram shows how the link wire is soldered to the diaphragm and fastened to the cone by scaling was

the armature is fastened directly to the center of a paper cone

The homemade loudspeaker illustrated is a combination of the Iron diaphragm and the paper cone types.

SPEECH, as reproduced by this homemade loudspeaker, is particularly distinct. The sh and other abilant sounds come hising from the paper in fine style, and you can understand every syllable spoken by the person who is broadcasting.

The list of material you will need to build this loudspeaker is very brief. Here it is:

A—phonograph loudspeaker unit; B— wooden chopping bowl; C—paper cone; D— link wire; E and F— supporting legs, thumb-

tacks, sealing wax, etc.

The phonograph loudspeaker unit A used in the model loudspeaker was of a standard, adjustable type using a locquered, metal disphragm. Any of the standard units can be used at A and if you cannot secure the adjustable type, a non-adjustable unit will give good results. It is also possible to use one of a pair of head phones.

The wooden chopping bowl B should be of the largest size obtainable from your local hardware and house-furnishing store. The one used in making the loudspeaker shown in the illustrations cost 69 cents.

The paper cone C is made out of heavy brown wrapping paper. Thin paper can be used, but will not give as good results as the heavy stuff

THE link wire D should be a piece of bare copper or brass wire not larger than No. 18 gage. Although copper wire is not very stiff, it seems to work well enough at this point, because it is so short that there is no tendency for it to bend out of shape.

The first step in constructing the loudspeaker, after you have all the parts, is to study the loudspeaker unit and find out how to take it apart so that you can get at the disphragm. In some units, removing the disphragm is only a matter of screwing off the cap, but in other styles the disphragm is tightly clamped between two rings, and the cup containing the pole pieces and cods is made so that it can be moved back and forth with relation to the disphragm.

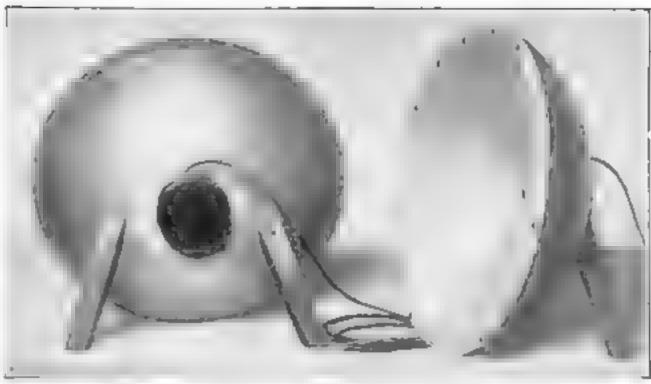
At any rate, do your investigating

with the greatest care so as not to injure any of the parts. Do the work on a clean apot on your bench so that there will be no chance for dirt or small particles of steel or iron to get into the inside of the loudspeaker unit. Steel or iron particles are to be avoided particularly, because they stick to the ends of the pole pieces and jam between them and the diaphragm, seriously interfering with the operation of the unit. Do not try to pry the diaphragm away from the pole pieces, as this proceeding will result almost surely in bending the diaphragm. Slide it off sidewise as carefully as you can.

AFTER you have the disphragm out of the unit, acrape off the shiny black inequer from a spot about a quarter of an inch in diameter in the exact center. The best way to do this is to use a sharp knife, with the metal disk placed flat on a clean, amouth piece of board. Do not use too much pressure on the knife, since this may result in putting a dent in the center of the disphragm. Of course, the spot must be acraped on the side of the disphragm away from the pole pieces. If the disphragm of the loudspeaker unit is of the bright, tinned variety, no scraping will be necessary, for the solder will flow onto the tinned surface.

The next step is to solder the link wire D to the bare spot. Iron is not the ensiest material in the world to make solder stick to, but you will have little difficulty If you use a bot from and plenty of soldering paste. The excess paste can be wiped off afterward, of course. Leave the link wire several inches longer than necessary. It will be easier to hold while you are doing the soldering and it can be cut off to the proper langth later on. Be sure that the wire is as straight as possible. Also, the solder joint will be much stronger. if you bend shout an eighth inch of the wire at right angles so that the solder will have a greater surface to hold.

Loudspeaker units for use on phonographs usually are made with a projection on the front that fits into the end of the tone arm of the phonograph. Through the center of the wooden shopping bowl B, bore a hole somewhat larger than the diameter of this projection so that the unit can be clamped flat against the back of the bowl as shown in the diagram on page 60. It really makes no difference what size the hole is, so long as it permits the projection of the loudspeaker to fit through it easily. The unit A used in the loudspeaker illustrated was fastened to the back of the



Surprisingly Simple to Build, It Gives Good Results

Two views of the paper cone-chopping how speaker. Notice the way in which the phonograph user is errached to the back of the bowl also how the supporting legs are attached. The legs are simply stacks of woud cut to the right length and beveired. The tone and volume of the speaker of course, will depend largely on the qualities of the phonograph unit used with it.

chopping bowl by replacing two of the screws used to hold the disphragm cover in place with long screws that projected through two holes drilled through the chopping bowl. Nuts turned down on these screws held the unit rigidly.

If the unit you purchase is not constructed in this way, or you use one of a pair of head phones, a cetisfactory method will be to shape up a clemp of this brase that can be bolted to the chapping bowl.

Clamp the unit A in place on the back of the bowl B and you will be ready to prepare the paper disphragm C. This is a much simpler job than would appear at first glance. All you need to do is to cut out a circle of paper considerably larger than the diameter of the rim of the chopping bowl. Then, with the scissors, make a straight cut from the edge of the circle to the center. Be sure to use paper that has not been folded, since the creases make it difficult to form a smooth cone.

NOW lay the paper circle over the chopping bowl and push down on the center it will form into a smooth cone shape as the center is depressed, and the edges of the paper will overlap where you cut to the center. The point of the cone should project down in the chopping bowl to within an inch of the bottom. The wire from the disphragin can be allowed to project through the center of

the paper. Cut off the wire within an inch of the paper. Mark off where the edge of the how is on the paper, then remove the paper so that you can cut with scienars around the circle you have marked. Next bend over about an eighth of an inch of the link wire at right angles, being careful to keep the rest of the wire straight. Replace the paper cone in the same position it had when you marked off the circle and, after making sure that the point of the cone is centered exactly over the middle of the disphragm, use thumbtacks to fasten the edge of the paper to the rim of the chopping bowl.

HEAT the end of a stick of scaling wax with a match and let about two drops fail into the point of the cone so that the bent end of the wire is covered with the wax. Be sure that the wax is good and hot so that it will stick to the paper properly. After that you can put a drop or two along the joint in the paper as shown. This will prevent vibration.

This completes the work on the loudspeaker, and all that remains is to fit the two support legs E and F. As shown in the illustrations, these are simply sticks of wood cut to right length and heveled.

Satisfactory loudspeaker units can be purchased for about five or all dollars. The tone and volume obtainable will depend to a large extent, of course, on the qualities of the unit. The rest of the material should not cost over a dollar and results certainly will be worth while.

Sold E of our readers may wish to know why the paper is formed into a cone shape rather than fastened in a flat sheet across the rim of the bowl. There are two reasons. One is that the cone shape makes possible a short link wire. This is an advantage, since a long, heavy wire would act as a damper and out down the volume considerably. The other reason is that the restricted air space between the paper cone and the inside of the chopping bowl helps to keep the paper diaphragm from blasting on the high notes, a trouble that is not met with in the factory-made paper-come speakers, because the electrical units used are built to overcome it.

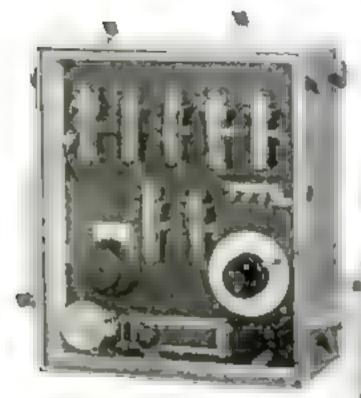
Have You Built Your Prize Set?

POPULAR SCIENCE MONTHLY is offering \$225 in cash prizes for the best radio receiver built to specifications set forth in our December number. You still have a whole month—until January 15, to be exact to enter your set in this unusual contest. Competition is open to everybody, everywhere. You don't

have to be a radio expert to have a chance to win.

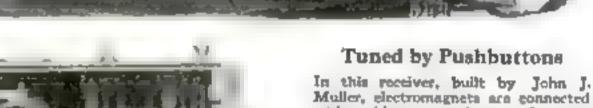
Rules and complete deta is of this fasc nating contest appeared in the December Popular Science Monthly. If for any reason you missed this number, you can get a copy from your newsdealer, or you can consult one free in your public library or in any of the offices of Popular Science Monthly.

Unusual Hook-Ups and Ideas in Radio



New Airplane Radio Set

Above is a very compact radio receiver designed for use on British fighting sirplanes. At the right is the vacuum tube transmitter. The wave range of the outfit is from 75 to 140 meters. Its communication range is approximately three miles, sufficient to enable all units in flying formation, as well as squadrons, to keep in perfect listson. The complete outfit weighs 67 pounds



Muller, electromagnets are connected with pushbuttons so that a push on any button instantly tunes the set to the station whose letters are on that button



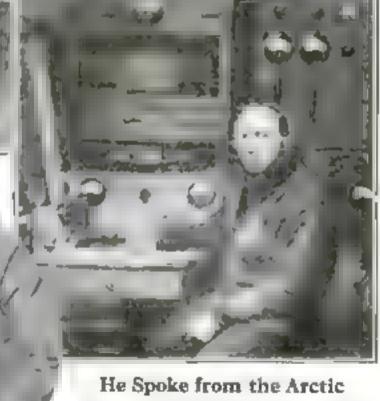
Instead of turning diels, you tune this receiver by revolving the top, on the edge of which is space to write the names of stations. It employs five tubes in a tuned radiofrequency circuit and will operate a speaker



In addition to the usual five tubes. George Tolley, the builder of this giant neutrodyne, has incorporated three extra tubes in a special pushpull power amplifier hook-up

A One-Meter Transmitter

Here is a transmitter that actually will transmit radio waves on the astumbhingly short wave length of one meter. For such high-frequency work, great care is necessary to eliminate all possible capacity from the circuit and to keep the connecting wires short



John L. Reinartz, radio operator, of the Bowdown, the MacMillan Arctic Expedition ship. During almost the entire polar trip he kept in touch with amateur operators all over the United States, by using a special short-wave apparatus

What 10,000,000 People Like to Hear on the Radio

How Broadcasters Select Programs to Fit Your Taste

By John E. Lodge

HEN you plug in
the loudspeaker
and begin turning the dials on your radio
set, what do you want to
hear? Jazz? Speeches?
Munic? Sport! News?

Perhaps you have no particular desires in the matter; you just sample what several stations are offering, and at last settle back to enjoy some broadcast feature that happens to fit your mood.

Many radio fens are like that; and yet so diversified is the typical broadcast program of today that one need do very little "shopping" in the other before bringing in an acceptable feature. That is because the brondcast studio managers know exactly what you and 10,000,000 other radio listenera like to hear. They spend their time finding out what you want and trying to give it to you.

"How do you know what the listeners want?" I asked the manager of a ploneer broadcasting station.

"Well," he replied, "finding out just what our listeners want is quite a problem—there are so many of them. And it is still harder to get them what they want. For the radio audience is be-

coming more critical every day.

"In the early days of broadcasting, the mere novelty of the thing kept people interested. Our programs were mediocre -we couldn't get high class entertainers and our transmission was not so good. But nobody cared. The listeners-in didn't expect real entertainment, and poor transmission didn't bother them at all. The ordinary radio receiver of those days would have reduced the best broadeasting to a mere raucous echo anyway. Just to be able to understand what the announcer was talking about was marvel enough for most radio fans, and getting distant stations meant a lot more than quality."

"But I understand that you received a lot of nice letters about those early

programs," I reminded him.

"SURE thing!" he said. "The poorest number on one of our early programs was good for at least a basketful of mail. Most of the letters were from people who just wanted to brag about their new toy —the radio set. Nine-tenths of them



Which Feature Do You Like Best?

SINCE the beginning of broadcasting, studio managers have been studying the studying of the radio audience with the idea of presenting features that will please the greatest possible number of people. The half-dozen sketches above illustrate familiar radio features in the order of their popularity, as indicated by letters received from fans. First come big sporting events—boxing matches, the world series, football games. Just music is next on the list, and classical music tune third. After-donner speeches and similar events in which the element of humar is present is the fourth choice of the radio public. Then come matning exercises and lactures and talks



A Prima Donna at the "Mike"

Public taste in music has improved most remarkably in the last two years, say radio station managers. Above is shown Madame Frances Alda, famous prime donne of the Metropolitus Opers Company, at a recent radio appearance that sowed a decided bit wouldn't have wasted two minutes listening to such stuff if it had come to them by some other way than by radio!

"But that mail meant a lot to us," he continued "You see, we were in need of an couragement. Broadcasting was just an experiment then, and the mail we received was the only evidence we had that anybody ever listened to our station.

"HOWEVER, the experimental days are about overnow, We know definitely that any station that goes on the air with a good program will have plenty of hateners. Waatill got letters, though, and we want them. They help us keep our finger on the pulse of public likes and distikes and so arrange our schedules that every listener will find at least one feature on each program to his liking.

"Another important end that ian mail serves nowadays is in supplying moral support to the radio artists. Most

of them cannot visualize the vastness of their silent audience. The average listener has no conception of the feeling of hopeless futility that seems the broadcasting artist the first time he faces the microphone. Letters, though, make the audience tangible to him, and the next time the artist appears, he is at ease and confident, because the performance is unconsciously directed to the writers of the letters."

"What is the most popular feature on your radio program?" I inquired of another prominent studio director.

HAT'S easy to answer," he said, "If I you will permit me to answer it for the city man and the farmer separately, By all odds, the most popular numbers on our program as far as the city man is concerned are the reports of sporting events such as boxing matches, the baseball world series, and the hig college football games. Next come the reports of big news events such as political conventions. Popular music is third; then comes classical music; after that, after-dinner speeches, political debates, and similar events. Lectures and talks of a more or less serious nature, unless they are on some subject much in the popular mind at the moment, are last on the list.

"As for the farmer, the weather and crop reports overshadow everything else that he hears over the air. This is understandable, of course, since accurate weather and crop news mean delars in the farmer's pocket.

"A really remarkable change has come in public taste in the last two years in connection with music. Jazz used to be the only kind of music the radio audience would listen to, so much so, in fact, that every time we ran through an evening without a whole lot of facz music and popular songs, we'd be swamped with hot letters from listeners complaining against what they called 'highbrow' music.

"JAZZ dance music is still more popular than anything size in the musical and, but there has been a decided shift in the latening public's teste toward classical music, especially stringed instruments, symphony orchestras and really high class vocal selections. A few weeks ago our program for an entire

day had no jass features, yet the fan mail was just about as large and favorable as if we had given nothing but jazz music.

"And, of course, every one knows of the tremendous response that greeted the broadcasting, last season, of prominent grand opera and concert stars by way of a whole chain of stations. A phonograph company put on the programs and it is said that more than 150,000 records were sold as a direct result of one song by a well known artist.

"This senson broadcasting by opera and concert stars under the auspices of a large radio company is meeting with a similar enthusiastic response"

Several other studio directors mentioned this trend of public tests in the direction of high class music. Most of them seemed unable to account for the change. One director, though, had very definite ideas on the subject.

"Why," I asked him, "are radio fans acquiring a taste for good music!"

"THAT'S easy," he replied. "Before the days of radio, millions of people never had heard enough good music to become familiar with it and learn to like it. Radio actually is educating them to demand good music. Wait a minute—"he broke off while he thumbed over a mass of letters in a special file beads his deak

"Here you are," he said. "This ought to show what I am driving at. These two letters are from the same man. You will note by the dates that they were written two years apart. In his second letter he mentioned the fact that he had written before, and I looked up his first letter out of curiosity. Now I am glad I did"

Here are extracts from the two letters. The first was written in January, 1923, and the second, November, 1925

The program from your station was received here last night with great



Your "Radio Eyes" at the Football Game

A firsthall game or other sport event of national importance pleases the largest number of radio inscenes. Here are Graham McNamer(with ginuses) and Phillips Carles (at microphone) announcers of Station WEAF describing the Army-Notre Dome football game at New York City

elearness and lots of volume and it was enjoyed by my family as well as several guests. We all join in thanking you for the entertainment you have afforded us. Every word of the announcer could be understood. "Somebody's Wrong" and "Tennessee" were great. That is sure some music! Give us more like that and lay off the classical stuff. It is all rightfor those who like it, but nobody around here does at any rate.

And the second one:

Please give my best wishes to T-S-time violing percentage last night were wonderful. My new conetype loudspeaker seems to be particularly good on the violin pieces. I enjoyed the "Grand Opers Hour" on Thursday immensely, and hope this will be made a regular feature.



Radio Fans Insist on the Best

No matter what the feature say the brundcasting managers, the radio audience insists these days that it he put over by an expert. That is why noted stage stars, such as Raymond Hitchesek (above), invariably please "There's the answer in a nutabell," went on the studio director. "That man and millions more like him are developing real teste in music, and radio is responable!"

A starting improvement in the general public's musical ear is not the only change that radio has brought. All pass may be jazzy, but there are different ways of playing it, as some of the studio directors have found out. And the same thing applies to other popular features such as the latest sentimenta, love songs and comedy numbers.

"The job now in to supply really high class talent," said the studio director of one of the biggest stations.

"I NEVER heard of such a critical audience as the bench of radio listeners who tune in on our programs. It seems to be easy enough to please them in the variety of selections. The just hounds like a little good music and a song now and then. And even musical critics can stand a bit of just dance

music. But there is one sure thing—no matter what kind of a program you give them, they'll jump on your neck unless each feature is put over by an expert. The day of 'kerosene circuit' musicians and entertainers is strictly past as far as radio is concerned. Nobody but the head-liners make a hit nowadays. And by headliners I mean those artists who really know how to sing or play, regardless of whether they already have made their reputation on the legitimate stage or in concert tours."

What about the artists who refuse to broadcast on the ground that they will spoil the sale of their services for personal

врреатичеся?" I ликеd

"If any artists want to stick to that idea, that's their privilege," he rapiled. "They are mutaken. Radio has put many artists' names on Breadway in white lights Before broadcasting they were hard up to get any kind of dating. The fact that the radio public is so critical is known to the theatrical booking agents, and you may be sure they keep their eyes open for new artists who make big bits with the loudspeaker audience."

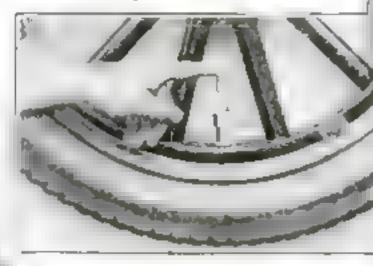
THE radio audience, some 10,000,000 strong, naturally represents a pretty thorough cross section of the American people. And among so many it is certainly possible to find a desire for every form of entertainment or instruction.

"We have had requests for almost everything under the sun," another studio manager said. "But just one letter asking for a certain feature doesn't mean that we will put it on the program. It's a matter of numbers with us. When several letters come in, all asking for the same or a similar feature, we sit up and take notice, and, if it is at all possible, the requested feature is placed on the program.

(Continued on sect 144)

Novel Auto Fittings

Improved Tools and Handy Accessories for Motorists



Whistle Signals Tire Puncture

This remarkable device is acrewed on the valve stem in place of the usual dusteup. When the tire is punctured, the whistle sounds a shrill note that continues until the device in turned of



Goggles for Night Driving

These goggles for the motorist are designed to reduce glare from approaching headights. Fin shaped projections cut off all light from the sides. They are cut low enough so that the wearer can obtain full vision above them

Spark-Plug Wrench

The swivel handle on the handy socket wrench pictured below makes it possible to get the spark plugs out with little effort



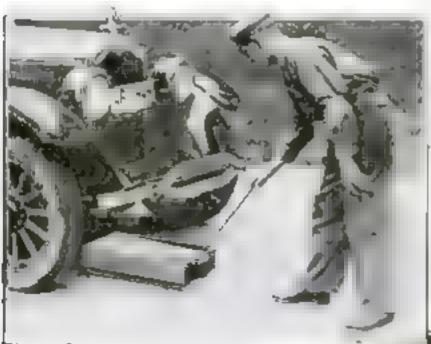
Any motorist who has wrestled with the ordinary one-pece type of auto-tire rim will apprenate the advantages of a rim that is built in hinged sections so that

It will collapse when a catch is released. It is claimed by the manufacturers that the strength of this folding type of rim is just as great as the standard types. As shown above, the tire can be removed from the rim without at all bending the rim



Electric Cigarette Lighter

Below is an electric eigarette lighter for the instrument board. The eigarette is inserted in a small tube. When the tube is raised, the eigarette end is quickby lighted against the heating element



Brake-Band Reliner

Relining the brake bands on an automobile is a tedious and difficult job without the proper equipment. This novel machine can be mounted on the workbench in the garage. It removes the old rivets and then punches, coun teranks, and rivets the new brake lunng in place.

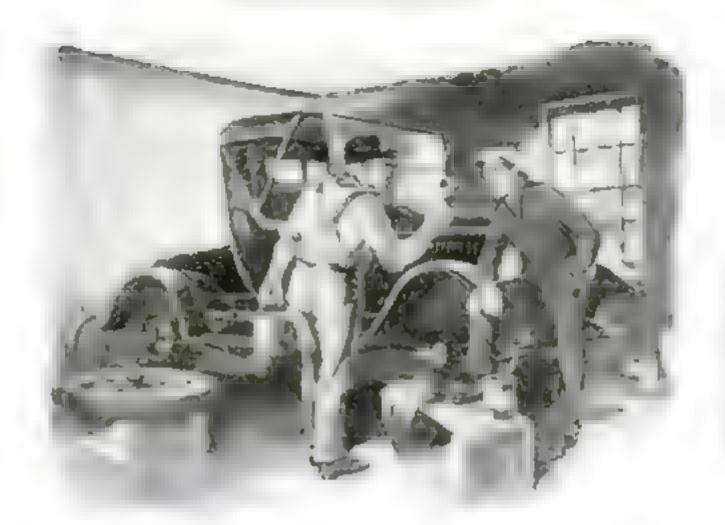


Tank for Draining Crankcase

Most automobiles are built with the drain plug of the crankease so close to the ground that it is impossible to get an ordinary pail underneath the plug when it becomes necessary to drain and refill the crankease with new oil. This ingenious shallow tank with long flexible handle successfully solves the problem.



This imique wrench is so constructed that the six individual sockets form into a next that can be stowed away in the nine-inch handle. It fits bex nuts from ourhalf to seven-eighths inch. A seven-inch extension is included YOU don't have to be an expert to make the old has shine like new," says Gun. "All you need is good brushes, good paint, and the right dustproof place to do the job."



In a dustryroof corner of the Model Garage Gus demonstrates to Joe why a high grade brush is important if you expect to do a fine per or ng job. "A Mecent bergs in sale brush simply went flow the paint on amouthly and you have to upend half your time picking off the brustles"

How to Paint Your Own Car

Gus Tells Why It Pays to Be Fussy about Dust and Your Brush

"HAT in blases are you going to do with all that paint?" exclaimed Jon Clark, half owner of the Model Garage, to his partner as the atter pulled can after can out of his car and arranged them in a neat row on the workbench.

"Do you suppose I'm going to drink it?" Gus Wilson grumbled. "Read the labels on the case if you're so durn curious!"

Joe stooped over to look at the labels more closely "'Body Filler'—'Best Pagment Ground in Od'—'Fine Coach Varnish'—" he read.

"I'm going to dol, up this old bus so she looks like new," announced Gus. "Any objections?"

all right. Your old boat looks like the moths have been making a meal out of it. But where did you get the notion that you're an auto painter? Takes an expert to do a good painting job. Just because you can fix the mechanical part of an automobile is no sign that you know how to paint the thing too. I'll bet it'll look like the dickens when you get through with it!"

"IS THAT so?" Gus growled scornfully. "Well, you just keep your eye on me now and you'll learn nomething."

He cast his eye appraisingly over a partly walled-in corner of the garage and then proceeded to pull out a large roll of cheap cotton cloth.

"You see, Joe, the first thing you have to figure on," Gus began, "is a place to do the job. That's more than half the battle because you can't do good painting in a cold, dusty room. I'm going to start by

By Martin Bunn

closing in that corner so I can work without you or the customers shuffling up a lot of dost all over the fresh paint. Tomorrow I'm going to bring down a couple of oil stoves to keep that corner good and warm so that the paint and varnish will flow easy and dry as quick as possible."

"HUMPH!" and Joe, rubbing his chin reflectively. "Maybe you do know what you're about, after all. Come on —I'll help you put up the dust wall before I get busy with those hills."

But there were interruptions in the form of emergency repair jobs, and it was two days before the last piece of cutton cloth was tacked into place and Gus was satisfied with the arrangement.

Gue always had been in the habit of keeping his car pretty clean as well as in perfect order mechanically, but as soon as the paint room was complete he set to work to give the machine a washing so thorough that it was not finished until every speck of grease and mud had been removed from the body and running gear.

"There you are," said Gus with satisfaction. "That car is what you could rail chemically pure! If you can find any dirt on that boat, Joe, I'll est every grain of it.

"I kind of hoped I wouldn't have to take off the old paint, but now that I have it perfectly clean. I notice that it is checked and cracked in a lot of places. There are some spots, too, where the paint has chipped off and rust has started. I guess I might as well begin at the beginning and take all the paint off, right down to the bare metal."

"Phew!" gasped Joe a few minutes later as he came coughing out of his little office. "That's a gosh-awful smell you're making, Gual What brand of paint remover a that? I never smelt anything so rank "

"You'll get used to it," grunted Gus.
"I mixed it myself—half benzol and half acctone. It is kind of whifly, I'll admit; but if you leave it on for about an hour, you can rub the paint off with an old rag or acrape it off with a putty knife."

By the next night Gus had removed the paint down to the bare wood and metal. Then he went over the car with steel wool and fine sandpaper, accaping the rust upots until the surface was smooth and even. After that he disted it off with a piece of cheeserloth or which a few drops of varrish had been poured. This he allowed to dry till it became tacky. This process removed even the invisible dust, so Gus said.

YOU see, Joe," he remarked, standing back and regarding his work with pride, "there's one sure thing about painting. You can't do a good job unless you put the paint on the right kind of a surface. One oily spot, or even a greasy finger mark, may cause the paint to peel off a few months later and ruin the whole job. And now I'm ready to put on the priming coat," he concluded as he bussed himself with his array of caps.

"Gosh!" exclaimed Joe. "Looks as though you were setting out to do a real bonest-to-goodness professional job-about 17 costs of paint."

"Not as many as that," Gus replied.
"Four costs will be all that I'll have time

(Contraved on page 145)

Be Your Own Boss

If you're tired of working for someone else—here's your opportunity to get into business for yourself. Be the Johnson Floor Expert in your community. We'll help you get started.

Earn \$15 to \$25 a Day

There's a bigger demand every day for floor maintenance service in homes, business and professional offices, stores, schools, clubs, hotels and public buildings. In just a short time you can have a business of your own that will pay you \$15 to \$25 a day. And all you need to start is a

JOHNSON'S WAX Electric floor Polisher

It's the machine that insures success, independence—a business of your own. Light and easy to operate. Runs from any light socket. Simple and sturdy in construction. Nothing to get out of order. Polishes floors ten times faster and better than any other method. Gets under devenports, buffets, beds, desks and other low pieces without moving the furniture.

Investment Less Than \$50

Think of it! For less than \$50 you can have a profitable business of your own, with a high-class clientele. No more lay-offs. No more dull seasons. You'll be giving orders instead of taking them. You'll be a recognized successful business man. Mail coupon today for full information on the Johnson Floor Service Plan.

Don't Delay-Act Now

Don't put off mailing this coupon It will mean the comforts and luxuries of life. A bank account A home of your own. Safe years shead.

Fill Out and Mail This Coupon

S. C. JOHNSON & SON, Dept. P S.1 RACINE, WIS.
"The Floor Finishing Authorities"

Please tell me how I can earn \$15 to \$25 a day giving Johnson Floor Service.

NAME

ADDRESS

CHT

.....BTATE

Useful Hints for Car Owners

A Novel Patch Press-Simple Remedies for Motoring Troubles

MOST important point in making puncture repairs with cemented patches is to use plenty of pressure on the patch while the coment is setting. A short piece of board carried in the toolkit will permit you to use your regular jack, as shown in Fig. 1, to clamp the tube and patch against the under side of the runningboard

If your car is fitted with runningboards made of corrugated metal, it will, of course, be necessary to use two hoards, placing the second board between the underside of the runningboard and the tube surface

THE gasoline pipe frequently gets

clogged up between the main tank and the vacuum tank or, if there is no vacuum tank on the car, between the main tank and the carburetor When this happens, It cometimes is difficult to clear out the obstruction without taking the whole pipe out of the car and uttaching it to the airpremure line.

For this reason it is a good idea to fit a petcock in the pipe line between the main tank and the vacuum tank, sa shown

In Fig. 2. Then, when the pipe gets clogged, the compressed-air connection van be made to the petcock. With the pipe disconnected at first one end and then the other, the obstruction quickly in blown out.

ERTAIN types of visible gasoline pumps are not provided with a relief valve at the upper and of the ducharge hose. This greatly delays the emptying of the hose after the gasoline has flowed out of the measuring compartment.

A cure for this trouble is a vent pipe arranged as shown in Fig. 3. It consists of a length of one-eighth-inch pipe connected with the supply pipe at the point where it leaves the measuring compart-The open and of the pipe is carried up above the top level of the gasoline in the measuring compartment so that there will be no chance for gazuline to come out at this point.

When the measuring tank is empty, air Yushes into the vent pipe and causes the gasoline in the supply pipe to run quickly into the motor's tank

POOR connections at the storagebattery terminals often are responsible for trouble in the operation of the

Occasionally the trouble is caused by wear. If your terminals are of the plug type, a good way to tighten them when they are worn so loose that the nut fails to draw them up tightly, is to fit a lead aleeve over the plug, as illustrated in



How a jack and small board can be used against the runningboard to exert. pressure on a live patch until it is secure

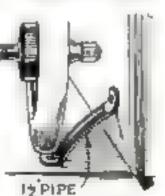
MARN TANK CUT OFF GASOLINE SUPPLY PIPE PET COCK UNDER FRONT FLOOR BOARD CARBURETOR -

Fig. 1. A percock fitted in good or pipe line between maratank and vacuum tank aids in clearing out an obstruction when the pipe gets clouged. A compresent air connection can be made to the percent and the obstruction blown out with little effort





Fig. 4 Above Classtype bettery terminal tightened with bring serew Below Plus terminal tightened with a load MOCVE



Рар б. Исв∨у pape (nature) norms corners prevents the cur scraping



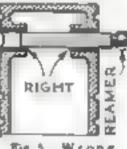


Fig 5. Weeng end right ways to de agaithand mass



Fig. 7. Radinter reprinted by cutting and soldering tubes

Fig. 4. Clamp terminals can be tightened by slotting the post on the buttery with a backsaw and screwing a brass screw into the slot after the terminal has been buited into

BADLY fitted bearings cause almost as much motor trouble as poor quality oil or scanty lubrication. One point in the automobile motor that deserves careful attention is the wristpin bearing. Owners who overhaul their own cars frequently make a serious mistake in attempting to ream out the new bushings they have fitted to the pistons. They run the reamer through from each side, and the result is often as pictured in

COPPIN

VALVE

TUBE

the upper illustration of Fig. 5.

A bushing fitted in thus way will bind badly for a while and then will become so loose that a tertific holes results when the motor is started. The correct way to ream wristpin bushings la to replace one bushing and then run the reamer through the new bushing by way of the old one on the other side, as shown in the lower Illustration. Then the latter is replaced and the process is repeated

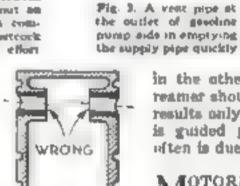
in the other direction. Theoretically, a reamer should follow the hole, but good results only can be obtained if the reamer is guided properly. Ton stiff steering often to due to crooked reaming.

MOTORISTS frequently so miscalculate the clearance in driving into the garage that the rear fender or hub cap always acrapes against the door. A simple remedy is to take some pieces of heavy pipe, and after flattening and bending the ends, fasten them at the door corners as shown in Fig. 6. They should be set at about a 45-degree angle. Then when you drive too close, the tire rides up on the pipe and slides the car away from the door so that the fender does not touch

WHEN a vertical tube, fin type radiator becomes frozen or is damaged through collision or fan bracket breakage, leaks develop in a number of tubes. The best way to repair such an gutfit is to eliminate the damaged tubes.

As shown in Fig. 7, the fins are pushed up and down until you can get at the burnt tubes. These are cut off at each side of the break with a saw made out of a short piece of backsaw blade fitted to a wooden handle. Then the ends of the tubes are squeezed flat with a pair of piters and tightly closed by soldering. After that the firs can be pulled back into place.

If the job is carefully done, the damaged area will not be noticeable.

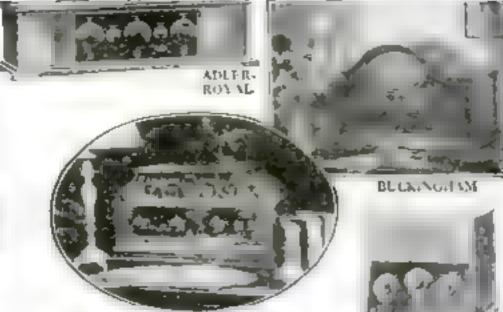




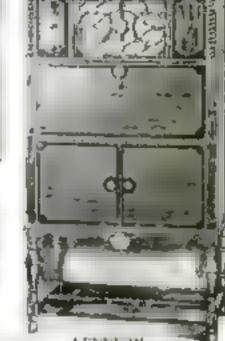
wrotpin bearings



ZENITH



DERESSADINE





PRHCEL

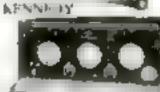




MEANSTHEEL

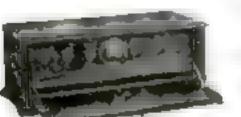


MUNN-LANDON





NEUTROWOUND



THERMIODYNE

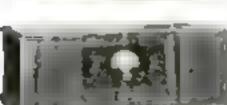


BLEESER REGEREN BEGERFAR BORGER B

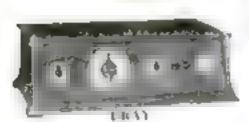
THORDARSON ELECTRIC MANUFACTURING CO. Chicaga U.S.A. WORLD'S CLOSET AND LABOURT ESCRIPTIVE TRANSPORMED MAKENS

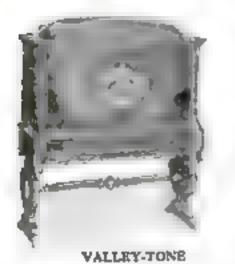


RADIODYNE

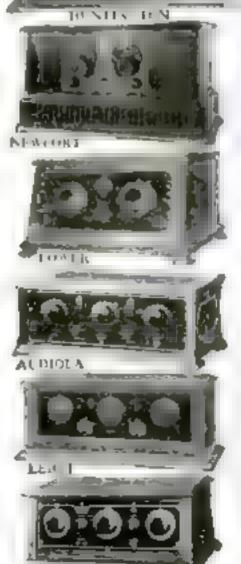


ML-RAD















Home Workshop

Arthur Wakeling, Editor

Gumption with Tools

N THE beautiful land of yesterday, when the writer and his compatrious were barefooted boys, perhaps none of us was rich enough to own a chest of tools; at any rate, none of us did

The writer can well remember when his older brother gave him a gouge or balf-round chisel. That gouge he used for everything except for pulling tacks. With it he made model sailboats of blocks of wood; with it he ungraved his name upon all the beech trees within the circuit of eight or 10 miles from his home. He cannot now remember all the uses to which that gouge was put; but it was the only real carpenter's tool he possessed and he used it upon aimost every occasion, as a balf-much scar still testifies

What he most desired, however, was a drawknife. Alast he never owned one; so he wrapped a rag around the pointed

end of a butcher keefe that he might graup it with no danger of wounding his hund. Then, using the real handle for his other hand, he found that it was not a bad substitute for a drawknife. With this crude tool he fashioned some very shapely and effective shinny stacks and bows. With bits broken Window-pane glass or fragments of flint he amonthed the surface of his hows and arrows

WHEN the boys of yesterday needed an awl, they did not go to the hardware store for it, because in those days boys were not supplied with a surplus of money; but they made their awis of turkey bone, hardening the bone by holding it over the hot coals until all the grease melted out, after which it was sharpened like an awl they took an ordinary "cut nail," there being no wire name in those days, and rubbed it on the atone front steps until its edges were rounded off, and then gave it a sharp point.

Next, the head of the nail was removed, either by slowly and painfully grinding it on a stone until it was worn off, or by using an old hatchet and resting

By Daniel C. Beard

National Scout Commissioner, Boy Scouts of America

YOU will not heatate to undertake any job in your home workshop after reading this article by Dan Beard. If you ever do have a moment of doubt, all you will need to do is to look at your kit of tools—your hammors, saise, planes, chisels, pliers, files, and all the other splendid examples of the toolmaker's art—and ask saurself. "If hat wonderful things couldn't a than Beard do with these tools?" Take the tools you have or those you can buy at the corner hurdware store and nor them with a linte of the "gampton" Dan Heard describes, and you will find your home workshop will become a place of real accomplishment.

he pointed accomplishment.

Dun Beard, chief of the Boy Scouts, at 75, making a how just as he described in. The American Boy a Handy Book." which was published in 1822

sta edge on the nail close up to the head and hammering the head of the hatchet with stone until the blade severed the head from the nail. In this way they made an awl, and when it was fitted into a wooden handle, it was an excellent tool. We used the awl for a leather punch and for various other purposes, as the occasion suggested.

As a rule we could borrow a saw with which to saw boards, or make a saw of a big kitchen knife by nicking it along its edge

When we could not secure a saw, we cut the boards off with the axe or hatchet with which all woodsheds were furnished. We first drew a line across them from side to side, then placed the edge of the axe or hatchet on the line and hammered them with some heavy implement. By this means we gradually made a deep groove all the way across the board. Turning

the board over we made another similar groove upon the opposite side, corresponding exactly in location with the first one. By carefully deepening these grooves we at last got the board so thin at that point that we could break it of with no danger of splitting; then we would take the edge of the sharp are or batchet and with it share the rough edge of the board until it was smooth

IN MY log house at Pike County, Pa., now used as the executive office of my School of the Outdoors, I have a substantial table, which we made entirely with no implement but an axe. The boards that serve for the top were cut the proper length an just described. I sometimes think that our multiplication of tools of today and our easy access to them make work so simple for us that it tends to dull our inventive power and in a measure atrophies our resourcefulness.

The old woodsman coold build a good house and furrish it without a nam or spike or any hardware whatsoever and with no tools but his axe. Give such a man an axe, a big two-hand

formanied as page 95)

How We Made a Winged Toboggan



FROM the extraordinarily graphic pen of a New York mining engineer comes this actual record of winged tobogganing at the Sunnyside Mine, near Silverton, Colo. The altitude of this mining camp is 12,500 feet above sea level, and the winters there are from September first to July first, Snow usually falls even in July and August. The author was the chief engineer and Harley Tryon the timekeeper at this mine,

Wings fitted to a roboggian add teamenmarable thrills to the sport of counting

By Paul H. Keating, E.M.

PLAYING and racing with death down a 1000-foot slope of frozen snow and ice may not appeal to some as a pastime, but the palling monotony of life in a Colorado mining camp, up on the Continental Divide, where the snow is 50 feet deep and the mercury is below zero for months, makes life seem very deab. Anything with a kick in it is welcome—anything.

Two of us, Harley Tryon and myself, were the charter and sole members of the Suicide Club, builders and operators of the only amusement device of its kind ever recorded, the toboggoplane.

Tobogganing is not a slow sport in itself, but like other speed aports, each descent must be a little faster, go a little farther than the preceding, or it loses its thrid.

A toboggan on a hard frozen crust will develop a speed greater than free full in a given vertical distance, for much the same reason that an ice hoat can go much faster than the wind that drives it. It takes longer for the given vertical distance to be covered, but at the end, the netual speed down the slope is greater. The "why of" thus is out of place here, but it's true

So, when I say that we hit the bottom of the hill going more than 200 miles an hour, I know the speed is underestimated. But even this pailed after a time. Keeping a toboggan upright is much like riding a bicycle, or balancing a canoe, for at high speeds a very small irregularity on the surface can have disastrous effects. Our instruction from Old Man Experience on this point came in sudden and enormous doses. But in a short time there wasn't a his around the camp that could offer a "kick" We could ride them all to a standatill

ONE night, after a comewhat dull toboggan party, the idea was suggested to build a set of wings on the toboggan Maybe it would fly!

I suggested it, and Tryon said, "If you'll build it, I'll ride the thing"

From the carpenter shop next afternoon I obtained some strips of pine, some muslin (used for wrapping ventilating piper, and some piano wire. The taboggan itself was of standard design, 18 in, wide, 9 ft. long, with a curl in front 9 in, high

The wings of the Dragonfly, as we later christened the toboggan, were made of a framework of knot-free pine strips, covered with muslin, which was painted with hot parafiln to make the fabric sirtight.

Two strips 2 by 235 in, and 11 ft. long were fastened together by four cross-pieces 1 by 235 in by 4 ft. 2 in. Notches or mortises were cut in the longer strips to take the shorter ones, as illustrated, and a single sixpenny nail was driven into each joint from the outside

The frame was laid on a floor and trued up with a steel square. Piano wire, about No. 22 gage, was then strung as indicated and drawn very tightly around each crosspiece and diagonally

CROSS-WIRE

DEVICE

Z TOBOGGAN

GUY WIRE FROM TIP TO TIP

THROUGH EYE BOLTS ON

A wire braced frame

work of 1 by 21, in. strips is covered with

peradimed mealin to form wings for the tobogysu

ADJUSTING

SIDE VIEW

ncross each section of the wing. Shingle nucle driven into the strips served to anchor the wires.

Each cross length was drawn until all gave approximately the same hum when picked. The diagonal wires also were adjusted to the same pitch by putting a lock washer around the intersection and drawing it by a wire toward the back of the frame until the tons of the wires was about even

ORDINARY unbleached muslin was stretched over the entire frame, fast-ened every 2 in, with carpet tacks. The center or "cockpit" then was cut out and the loose edges tacked down. After prying the frame from the floor, to which it had been lightly nailed during the traing-up process, the muslin was painted with very hot paraffin.

Two holes were drilled in the top of the curl of the toboggan I ft. apart, and three turns of ordinary baling wire held the wings in place along the leading edge.

The rear edge was fastened similarly to the iron eyebolts along the side of the toboggan. A continuous guy of pinno wire was strung from the front tip of one wing through eyebolts in the floor of the sind to the other wing tip, and d awn tight

The next thing was to try it. With
the cushions in
place, it looked
every bit a dragonfly, but as a passenger carrying device, we concluded

BINDING WIRE TO RENTORCE PRAME
INCL NATION OF WING

The original Dragondy after many perilous trips down a Colorado mountain side

What Will You be Earning One Year from Today?

A practical plan that is doubling men's salaries

You have said good bye to Vesterday, with its failures and disappointments. A new Tomorrow lies ahead of you. What are you going to de with it?

To the man who gives little thought to his bu incan progress, one day is much like another—filled with routine work—rewarded by routine pay. He has no right to expect great things of the future.

But - how different the outlook of the man who is treising for promotion, and

what a difference a mere twelve months can make in bin earning power!

Give a thought, for instance, to the experience of 5. N. Windows, a Kentucky man, who has specialized—with the co-operation of Laha, a horeastern University—in Salesmanskip. "My salary was practically doubled a short time ago," writes Williams, "but my greatest astisfaction comes from knowing that the amount of business I have writen that year is easily five times greater than before." Windows, you see, has a real future—because he is constantly preparing for it.

Increases Salary 150%

Again, consider the experience of Arthur W Weber, now Assistant Sec-

retury of the Ohio Savings Bank and Trust Company, one of the largest and most influential banks in the state. One of his earlier letters reads as follows:

"Since I have been training, my salary has been increased 150 per cent. This increase is an annual return of 1,107 per cent upon my investment. Not so had when you consider that most conservative investments net only 6 or 8 per cent. Incidentally, LaSabe training has sided me in jumping from the job of timekeeper in an automobile factory to my present position as assistant auditor of the largest and trest bank in Toledo in less than eighteen months.

"There is one outstanding point about

LaSalle Extension University—it is not your excellent text-books or your well-built organization, but your willingness to belp and encourage the student to succeed. It has been my experience that an enrollment with you is not a cold-blooded business proposition, but a real, cheerful, sympathetic willingness to help the student."

More recently he writes as follows. "Monthly dividends are being paid me on my investment in LaSade training in

many, many times is evidenced by the fact that during only six months' time as many as 1,348 LaSalle members repursed definite salary-increases, as a result of training under the LaSalle Problem Method, totaling \$1,399 507. The average increase per man per \$2 per cent.

The records of these 1.248 members restricting every mate in the Union and every most occi (Uanada | are all recompted in a fascinating book emitted "A Geography of Success." The following

are a few of the promotions here recorded

'From \$110 to \$385 a memb.

Cerk to Branch Manager, at \$10,000 a year "

"Salesone to Sales Manager; salary doubled," "From \$1,400 to \$5,000

PassenC. P. A. examination now partner in \$20,000 firm."

A copy of this book will be sent you for the asking. And—it's well worth sending for!

Send for Salary-Doubling Plan - Free

Yesterday in past. Let's not be hampered by it. To-morrow in whead of us. Let's make the mast of it!

Below that text there's a coupon—just such a coupon as Williams and Weber once signed,

as williams and weber once signed, and hundreds of thousands of others who, thru home-study training, have added greatly to their saming power.

You know your ambitions. They will decide for you the training you should undertake.

You do set know your espektittes. But they will unfold for you more wonderfully than you could dark to hope, once you begin with seriousness to fit yourself for bigger things.

Start today toward that better place, that bigger salary, by checking, signing and mailing the coupon NOW.



the form of increased salary at a role in second of 125 per and per month."

You Have the Same Good Opportunity

Skeptics may suggest that the records of Mr. Wilnams and Mr. Weber are exceptional. And—if these men had won their advancement without the aid of homestudy training, we should be bound to agree with the skeptics. For men are rarely promoted to positions they are not qualified to Mt. When men have find themselves for advancement, however, such promotions are not exceptional at all.

That their experience could be paralleled.

LASALLE EXTENSION UNIVERSITY

The World's Largest Business Training Institution

| | | D MAIL | | 11-25-11- |
|---|--|--|--|---|
| LASALLE EXTENS | ION UNIVERSITY | Dept. 183-R | Chicago | Sunta Marie |
| I shall be good to have details of in the business field I have | poor entery doubling plan, together wit checked below. Also a copy of A | a complete injurnation regard Geography of Success," all w | ling the opportunities thout obligation | 1 3 4/ |
| Huntage Management: Train og for Jifirial, hintageria. Sales and Departments! Executive positions. Modern Sales Executive. Salesman. Sales Couch of Trainer. Sales Promotion Manager. Bales Executive. Salesman. Sales Couch of Trainer. Sales Promotion Manager. Blungfacturer a Agent Solicitor, and all positions in retail, wholested, or specialty selling. Tigher Accommunity Training for position on Auditor. Comptroller Cartified Public Accommunity. Cast Accountant, etc. | Lawr Training for Sur; Li. M. Dugran, Commercial Law: Breding, Reference and Commitation Service for Summer Men. Traffic Management - Pervice and Domestic Training for position as Hail- tool or Industrial Traffic Manager State Expure, Freehold Selection, sta. [Indiag for position of Exation Accommand. | Indiscipled Management To her her auto of a Works Ma. Production Control, Industry wearing, etc. Methods Transcriptor position Management, such as that a lendert. General Paratist, just Farman, etc. | realization of the state of the | r Tribing for pasition officers on Correspondent on Manager. Mail Sales where etc. Training for Sanddents and Copy Writers Spanish: Training for days Correspondent with any constrain. |
| Expert Bookknepley Training for goal- tion as Read Bookkneper C. P. A. Conching for Advanced Account- | Cashing and Agent, Division Agent, size. Hanking and Flammer: Training for executive passeons in Hucke and Pinancial lastitutions. | Pyromenel Manager Indust | Barager. Effective Special | shing: Training in the offective speech. for ones Protested Landon. house, etc. |

Name...

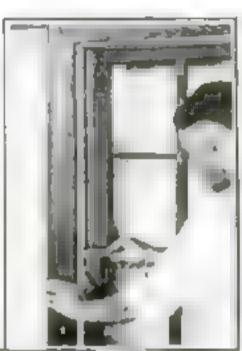
Replacing a Window-Pane

How to Remove a Sash from Its Frame, Take out the Broken Glass, and Putty a New Light in Place

By F. E. Tustison, Director of Science and Home Mechanics, The Stout Institute, Menomonie, Wis.

1 Unless the window is easily accessible from the outside, the sash must be removed. First take off one of the inside stops

2 (Center) Raise lower such shightly, pull it toward you, and remove such cord. The a loop in the cord so that it will not slip into the weight pocket.

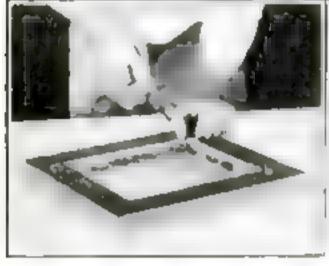






3 To remove the upper such, pull it all the way down, pry out the middle stop at the top with a charel and remove stop by pulling out and up. The such then a removed exactly as was the lower

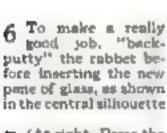
The accompanying photographs
were posed by
Osto P Schellinger, who is a
a peosalist in
household me-



4 Remove the purty with an old chisel, which should, however, be reasonably sharp. Do not expose the bare wood or repainting will be necessary before the purty will stick

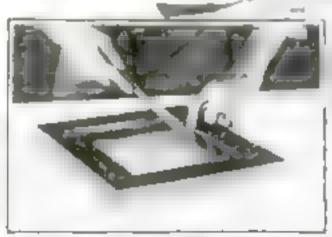


5 Either use the best linseed-oll putty you can buy or mix unseed oil and dry whiting together and add about one tenth as much powdered white lead, to give extra hardness

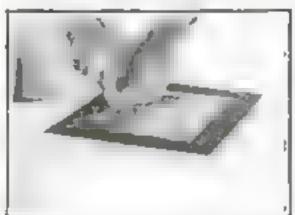


7 (At right, Press the pane firmly into the back putty and drive in a few glaster's points with your chief.)

9 (At right) The experienced glazier does the job with almost incredible swiftness by feeding the putty under the kmfe as he draws it along the rabbet. This takes considerable practice unless one happens to fell into the trick naturally. Try it the next time you have to repair a broken light





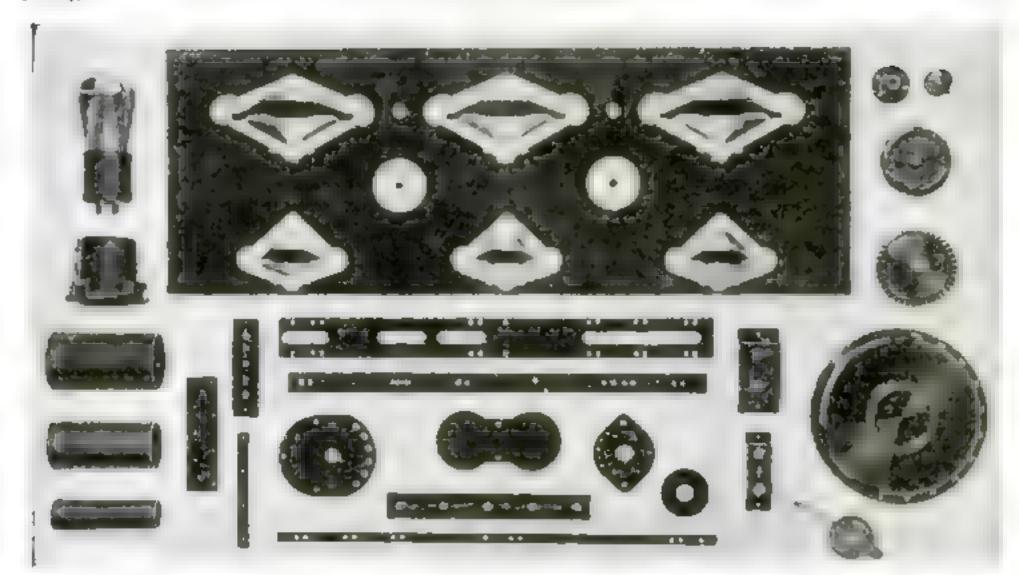




8 (At left) There are two ways of placing the putty. Perhaps the camest for the ama teur mechanic is to roll a thin string of putty and lay it bodily into the rabbet pressing it into place with a putty kinfe and smoothing it neatly with several continuous atrakes from corner to corner

10 if the mash is dark green, dark brown, or any other very dark color, the work of repainting the sash can be avoided (provided the original paint is in good condition) simply by blackening the putty as soon as it is applied with a little powdered lampblack.

TURN TO PAGE 78 FOR THE CONTINUATION OF THE HOME WORKSHOP DEPARTMENT



Imagine a Radio Set stripped of these parts

What a useless collection of wood, wire and metal it would be. Realizing that the parts and accessories shown here are wholly or partly of Bakelite, gives you a vivid picture of its importance to Radio.

Today Bakelite is used in a greater variety of radio parts than ever before—and the number grows constantly. This dominance of Bakelite in radio

reflects the experience and the opinions of radio manufacturers, great and small.

Radio set and parts manufacturers have every facility for testing all insulation materials and over 95% have standardized on Bakehte. This indicates how really important it is for you to make sure that the set or parts that you buy are Bakelite insulated.

Write for Booklet 25

BAKELITE CORPORATION

247 Park Avenue, New York, N. Y. Chicago Office: 636 West 22nd Street

State fite at the subtence to accordingly as perabethy and from historical by the State fite Congruent on the configuration. It is the only material which many bear this forces material of continuous material of continuous

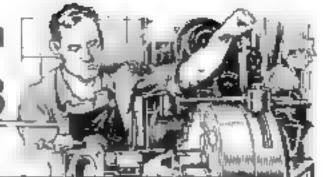
BAKELITE



THE MATERIAL OF A THOUSAND USES

This seal on a radio or tool advertisement signifies the approval of the INSTITUTE OF STANDARDS. See page

Better Shop Methods How Expert Mechanics Save Time and Tabor



Old Bill Threads a Bent Pipe

be stopped his filver in the yard of the Robinson Mill, Old Bill thought he must have been summoned to attend a convention of all the mechanical men in town. He was a bit preved, too, as there was much work to be done at the shop.

He followed a devicus way through the mill to the superintendent's office, but high pitched voices coming from the engine room made him change his course. He came upon a group looking at the engine and studying some drawings

"There is no use talking, Joe," the it ill superintendent was saying to one of his

annatants. 'I don't care whose fault it is; what we must do now is to correct the trouble."

"I don't believe there is anything you can get done here that will help you," Jack Watson, Old Bill's chief competitor, said. "Nobody in town can cut a thread on a 12-lack pipe bent like that."

OLD BILL joined the group, and after the usual exchange of greetings the job was explained to him. The mill had put in new boilers and pipirg system, and everything was coupled together all right except one pips, the last one. It was 12-in, pipe with flanges acrewed on, and this particular piece had a bend with about a 10-ft, radius that went from the steam beader to the throttle valve. It was too long, or the space it should go in was too short. The consulting engineer who had laid out the plant and the men who had put it in were still arguing that point

"It looks to me as if the thing to do is to cut-off a piece of the pipe," Old

Bill remarked

"The rest of us decided that a long time ago,"Old Bill'acompetitor rejoined shortly.

The consulting engineer stopped his disputs long enough to say, "We do not think a weld should be permitted in this pipe."

"Can you do it?" was all the mill superintendent wanted to know

"Yes," Old Bill said. "Get it down to

the shop as soon as you can."

A wave of surprise seemed to pass through the group. "How are you going to do it?" Old Bill's competitor asked.

"Come down and I'll show you," was the answer, and, knowing Old Bill, every one saughed

Old Bill realized that he had bitten off

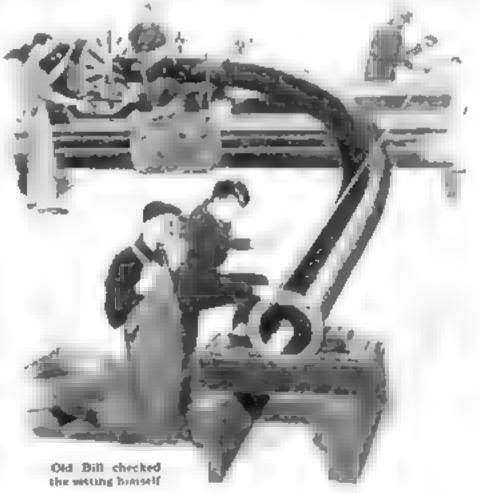
By James Ellis
Machine-Shop Superintendent

a mouthful, so as soon as he was back in the shop he set about to prepare for the pipe. He told Bob Laten what the job was, and gave him a drawing showing the dimensions that the pipe must be

"But, boss," Laten protested, "we can't awing this in a lathe, and the pape ma-

chine will not take it"

"That's all right," Old Bill replied "We have a 36-inch lathe that will do the job. Here is what we will do. I will show you how I think we can handle it."



Fortunately, the big lathe had room around it, and there was a small hoat overhead. Laten got a long straightedge, and, holding it on the faceplate of the lathe, he used a plumb bob to locate several points on the floor in line with the faceplate. Then he measured straight out from each of the lathe's centers and made other marks on the floor

He had men bring in all the wood blocking they could find. Then he got a good sized angle-plate and bolted it on the faceplate. To this he bolted a full swing rest from a smaller lathe.

By this time the big pipe was being dragged into the shop. Laten had it raised and set on the lathe carriage. The other end he supported with some of the blocks. It took a lot of straining to get the flange off the end that was to be threaded, but finally it was done. Then Laten blocked up that end so that it was about on a line with the lathe centers. He had his helper make some clamps to bolt the jape to the lathe carriage, while he rigged up a roller support for the free end

Truing up the pipe was rather tedious, but finally the work was located so that it was true and would roll on the blocks supporting the outer end for about 6 in.

A regular turning tool held in the toolpost attached to the faceplate was used for turning the pipe down to the correct size and taper for

threading.

Old Balcame out and checked up the setting himself once more to be sure that nothing had shipped. "I think I will call up lack Watson and get him to come over here and see how a roal machine shop can do things!" he remarked good naturedly

FOR cutting the thread the lathe was run backward rather slowly so that the ton, could be fed in a little by hand at each revolution to get the proper taper. The tool was started cutting on the large diameter of the pipe and ran off the end while the lead screw fed the pipe away from the face-plate.

Old Bill figured out that the thread should decrease in size eight-thousandths with each thread, so he had Laten use the micrometer dial on the full awing rest to advance the tool this amount each time the faceplate made one

revolution. For the first cuts a mar was stationed on each side of the lathe, and the tool was fed in four-thousandths at each half revolution, so that a practically perfect thread was produced by this method.

When the flange had been tried on for the last time and had been found to fit perfectly. Watson shook his head, a trife sadly, and said: "Next time I see something that I know can't be done, I think I will slip out of the way before you come around and do it"

MANY time-saving thop ideas are contained in the continuation of the Better Shop Methods Department, which you will find on pages 112 to 119.





You're going to need new tools this coming year. NOW is the time to start planning.

Send for this Supplement to the Starrett Catalog. You will find it invaluable in making your selection of the tools best suited for your individual requirements.

Many fine, new Precision Tools are described in this Supplement to the regular Starrett Catalog. Illustrations—uses completely described—prices the newest additions to the Starrett Line-it tells the whole story.

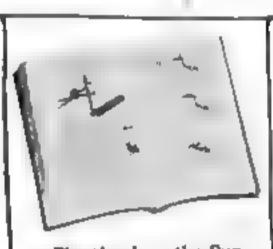
Write for it TODAY. Mailed promptly at our expense. Ask for Catalog No. 23 "W" and Supplement

THE L. S. STARRETT CO.

World's Greatest Toolmakers Vanufacturers of Hacksons Unexcelled Steel Taper Standard for Accuracy



arrett Ilooi



Showing how the Supplement to the Starrett Catalog describes tools and their uses. This free book has the information Send for it. you want.

3674



Hemoving starter screws with a "Yunkee" Quick Return Spice) Rat ant Screw-driver No. 130-3.

One-handed

you can quickly drive (or draw) screws in tight places.

That's where you want the "Yankee" Ouick-Return Spiral Ratchet Screw-driver

Put the blade in the screw slot. The spring in the handle holds it there.

You just push on handle.

The live spring brings handle back for the next push.

The long reach prevents backed knuckles.

"YANKEE"

Quick-Return Spiral Ratchet Screw-driver No. 130-A

Right and left ratchet; and rigid. Three a zes of bits

No. 134-A. Standard stre No. 131-A. Henvy pattern No. 135. Light pattern No. 135.

Without the Quick-Re-31 A No. 15

R tibet Bil Brace A mat Feed Beach Dvilla Ratchet Tap Witerches

Vises, with Removable State "Yankee" on the tool you buy means the utmost quality, durobility and efficiency.

Dealers everywhere "Lanner" Tools

With far a copy of "Yanker" Tool Book, of interest to those who love good took.

North Bros. Mrs. Co., Philadelphia, U. S. A.

Make Better Mechanics

To file a ripsaw, hold the file at right angles to the blade. Each tooth must be perpendicular on the front edge. Some mechanics prefer to lower the file handle 8 trifle. In either case it is well to file every alternate tooth from one ade and then turn the saw. This compensates for crrows

The Home Worksh op

How to File a Handsaw

Ey Emanuel E. Ericson, Noted Manual-Training Authority

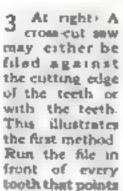


tooth. Then reverse the saw and set

the remaining teeth the opposite way

with a saw jointer or a flet file held on a block of wood. Take smooth, forward strokes. The edge should be a triffe convex or crowned

1 At left) First true up the edge





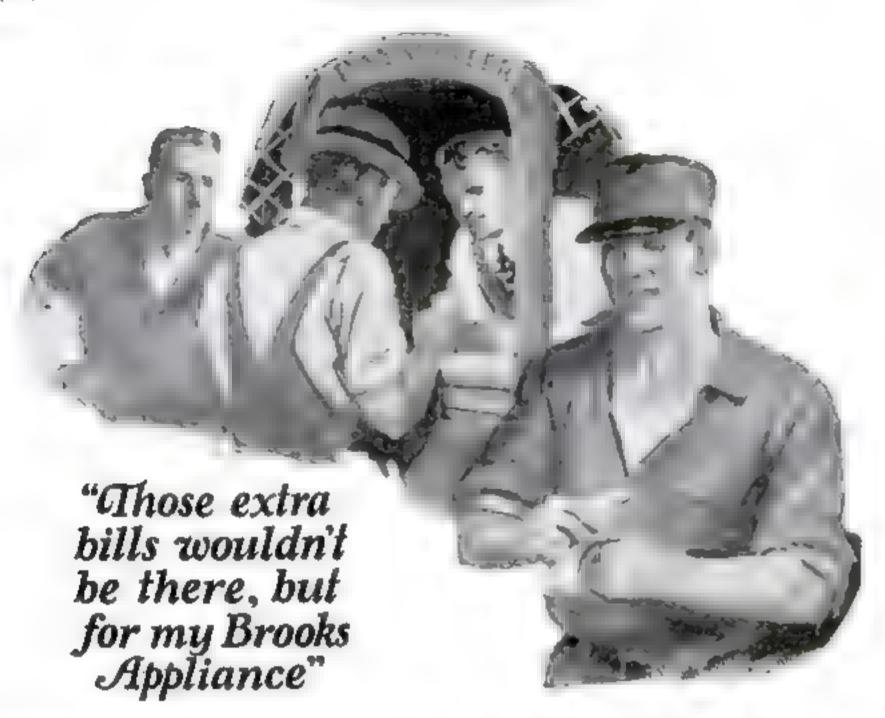
Below. When sharp, lay the saw on a flat surface and take a stroke or two on each side with a fine oilstone



Above at left) Turn the new in the new vise and file the temaning teeth. the is horizontal, but courts back toward the watch the points and stop filing when they are sharp



7 Straightening a kink with block and mallet. Beginners will find it a good plan to leave a few teeth at the extreme handle end of the blade untouched. It is these few teeth that will serve as a standard guide for setting and filing the saw



Does RUPTURE Cut YOUR Pay?

YOU CAN'T BE AT YOUR BEST—mentally or physically—under the handicap of rupture unless the condition is relieved by the gentle, soothing and healing restraint of a Brooks Appliance.

Throw away that old truss; free yourself of the irritation and annoyance of having to wear a steel and leather harness. Your Brooks Appliance weighs only a few ounces; elastic webbing holds a soft rubber air cushion in place, exerting an even and constant pressure, just as if it were the palm of your hand. That gives Nature a chance to repair the damage and eventually to effect a cure.

PROOF that the Brooks Appliance does heal rupture is found in the unsolicited testimony of hundreds of thousands of people in all walks of life whose letters, coming to us during the past thirty-five years, form our most cherished possession.

Send in the coupon today and you will receive valuable information on the treatment and heal-

ing of rupture in men, women and children, together with the names of many people who were cured after vainly trying other methods.

Sent on Trial to Prove It

Remember we send our Appliance on trial to prove what we say is true. You are to be sole judge. Now fill out and mail coupon—for yourself, a relative or a friend,

| BROOKS APPLIANCE CO., |
|---|
| 230-C State St., Marchall, Mich. |
| Please mail in plain scaled envelope yo |
| and full information about your appliar |
| |
| annut tunnet and there are any absorbible |
| |
| |
| |



good hammer

It's curprising how many men who work with tools feel like that about the Cheney Hammer.

Some prefer it for its "Never Shp" handle, Nail Holder in the head, others for the famous "Cheney Wedge" that keep the head always tight The curve of the claws, the swell of the face and the "hang of the hammer—these things have built the Chency reputation.

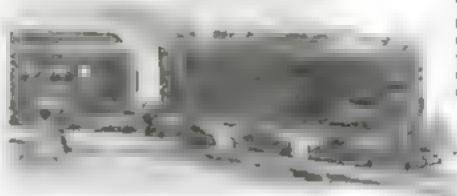
And behind everything stands almost 90 years of experience in hammer making and an absolutely unlimited guarantee same radius as the regular curved track that if it ever proves defective it will be replaced without charge.



THOME WORKS

Operating a Model Railroad by Electrical Controls

By James A. Baker



7 iiiil.E many men are interested in model railways, their particular fields of activity are not all along exactly the same lines. One man will spend most of his time on the production of locomotives. Another may be interested in the rolling stock of his model railway and a third, perhaps, may tackle the problems connected with control, signaling, and operation

In the article, "Automatic Control for Model Trains," published last month, instructions were given for making an electrically operated switch. A model track layout arranged so that all the switches are others like it for the controlled by pushbuttons permits remarkably realistic operation of

the model freight and passenger trains Before taking up the ways in which electrically operated switches may be used, there is one detail in the construction of the switches themselves that do nerves special attention

Standard track, as manufactured in this country, is made with the curved sections on a rather sharp radius. This is commercially necessary because the vast majority of sales of track are made in connection with small, popular priced, complete outfits consisting, usually, of a locomotive, two or three care, and a circle of track with just a few straight pieces. Most of the owners of these small output have but amitted space for a track layout-too smail, in fact, for curves of large radius.

Switches, naturally, are made to the

This is all right if you stick to commercial freight and passenger cars, but when you start building sessie models, trouble is experienced in getting the

longer cars through the switches

You will see In Fig. 1, the eastest way to remedy this trouble. A standard switch is shown

alongside one that has been altered by cutting away part of the curved section so that the care go onto the siding, or wherever the switch leads, without so ! much curved track. This arrangement is particularly valuable when the curved portions of two switches are connected se, for instance, in a cross-over. I have found that awitches altered in this manner

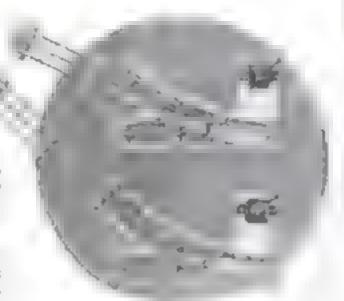


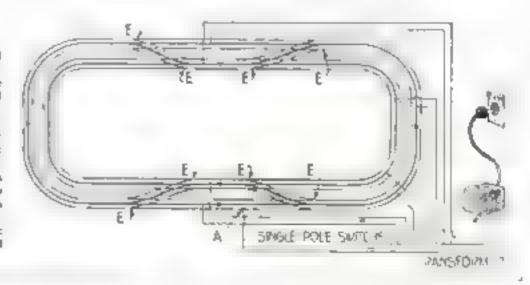
Fig. 1. A relatively straight switch for high speed train operation, and a standard switch

improve the operation of the standard rolling stock to a marked extent.

Now study Fig 2 You will see that it shows a track layout consisting of two complete rectangles with a double crossover on each side. Such an arrangement calls for eight switches, and if these all

(Continued on page 108)

Fig. 1 Diagram showing track beyout and wiring for current control. Center pens me removed from bard rul at points marked X Oue wire from teamsfarmer goes to track of may convenent point on outside rada A The other wire from of seog rearrokant puryches each of which a connected indepen dently with a different section of the third rail





In Radio especially— "it's the little things that count"

A list of some of the promment radio manufacturers using C-H products

Acme Apparatus Co. American Bloach Magneto Co. Antral Radio Corporation Retailer Radio Corporation Chelsen Radio Corporation Crosley Radio Corporation Dayton Fan & Motor Co. Detagraph Products Co. Dubiler Co. Corporation Electrad. Inc.
Freed Electrades Radio Corp.
Gared Corporation
Guillan Bron. Inc.
Allen T Hamacomb
Harding Mfg Co.
Haward Radio Co.
The Marcort Laboratories The Keyport Laliovatorian

R og Electric Mfg Co.

Kodel Radio Corporation

LeMay Radio Inc

Magrau Electric & Radio Co.

Mahon-Lemmon Laboratorian

Glenn L. Martin Co.

Win, J. Maydock

Newport Radio Co.

Phansushi Mfg Co.

Philidelphia, Starney Bat. Co. Philadelphia Storage Bat. Co. Radio Master Corp. of America The Radio Compak Co. R S. Radio Co. Robbins Radio Co. Signal Electric Co. Silver Marshan Co. Simplex Radio Co. R. E. Thompson Co., Inc. J S Timmons Workrite Mfg. Co. Zenith Radio Co.

THEN your radio set goes wrong, just as you are comfortably settled before the fireplace expecting to spend a great evening, it is annoying.

And ten to one, it's only some little wire or part that in itself is insignificant. Really, though, there's no excuse for such things happening.

GOOD parts of good material and carefully built are insurance against such annoyances.

Cutler-Hammer radio parts are GOOD parts, Both the amateur builder and the set manufacturer can attest that fact. They are designed by radio control experts, backed by 25 years experience, built of the highest quality material and sold at a price you are glad to pay.

Whether you buy or build, insist on C-H radio parts, for it's these good little parts that count and assure constant, efficient service from your set.

THE CUTLER-HAMMER MFG. COMPANY

Member Radio Section, Associated Manufacturers of Electrical Supplies MILWAUKEE. WISCONSIN



The closely wound, fine pesistance wire is prevented from slipping or wearing out of true by a bronce spring. That smooth, quiet control is ar-sured rether advancing to decreasing the potential.

There is no jamping, me bock look; and no seeking.

While C.H. Rheuptate stre built to engineers' specifica-trom, they are designed for the use of the nervice. They are built as a unit and are put dumanted for mounting.

Only our hold for mounting, Self contering in oversite holes and adjustable to may panel Bluchness.

CUTLER-HAMMER

Radio Parts for Performance



"ATKINS" The Best Gift for Real Men

Give no"ar VIKINS No. 400 Lifetime Saw this Christmas

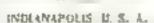
blue loss were its be-le cere treasure a because it VIUST ad its edge langer and car

1111115 Remember- x k for the Al KINSnameon the bade Write for new filder ' I Sawintheflowe"-sent free.

E. C. ATKINS & CO.

Established 1857

and the first





Me Monne Workshic

Sharpening Your Skates

Five Ways to Give the Runners a Keen Edge

By Lawrence B. Robbins

LL the real fun of skating is lost if your skates are dull Worn runners mean side slipping, uncertain footing, and consequent loss of speed in racing or during ice games. It behooves the true ekating enthusiast, therefore, to keep his akaten well sharpened

The sharpening can be done at home with the aid of the few ordinary tools shown in the accompanying photographs

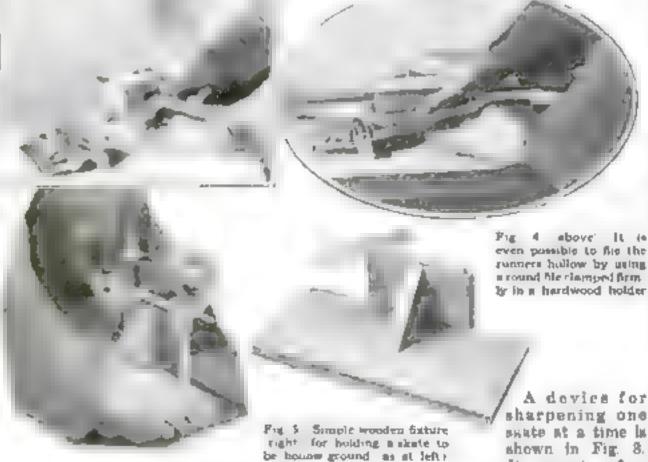
Skates can be filed singly at the beach, as demonstrated in Fig. 1, by clamping the heel in a vise and drawing a good

sharp file at right angles down the blade. Care must he used, to keep the file flat on the blade. An easier

Fig 3 (below A true edge is insured by haid ng the hir in e slotted wood block



Fig. 2 fat left --- A unfer method for be-Limners of the Costen of pair of sketch down and file both at once

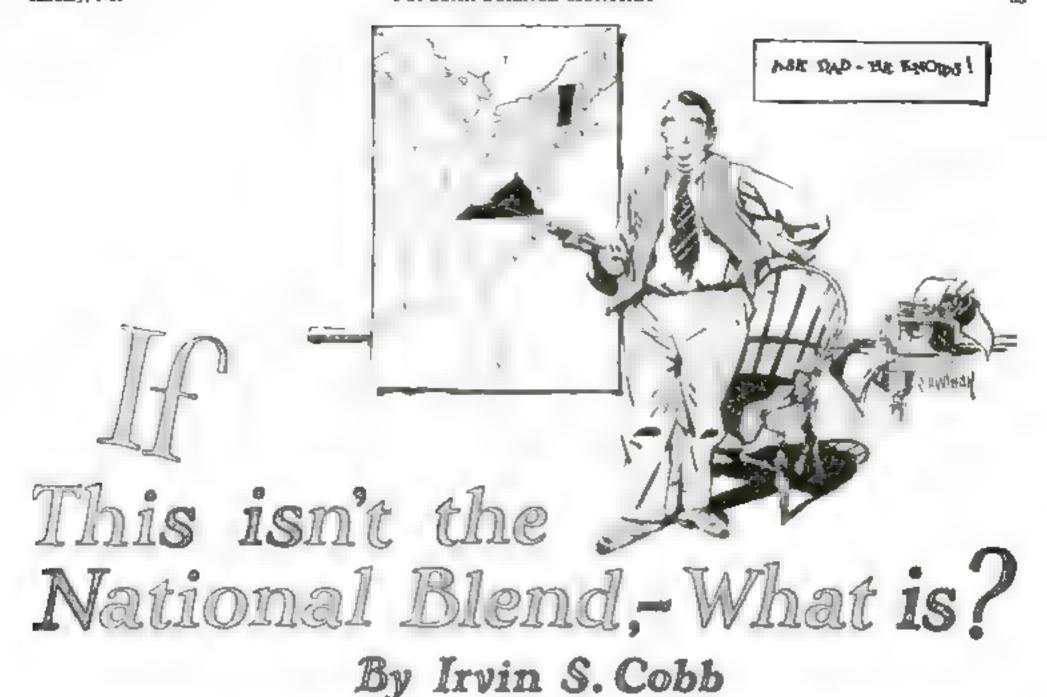


method of filing a pair of skates is shown in Fig. 2. Two blocks of soft wood, over which the heel clamps of the skates can be fastened, are nailed to the workbeach They should hold the skate blades parallel and as close together as possible. A third piece of wood should be placed in front of these to take the front ends of the skates. When the skates are clamped securely in position, sharpen them with a clean, flat file. Draw the file over the two runners at a dight angle and work from back to front of the runners until the edges are keen

suate at a time la shown in Fig. 8.

It consists of a block of hard wood about 1 1/2 in square and 4 in. long. If no block is handy, screw two 31-in pieces together. Cut an oblong hole through the side of the block to allow a flat file to be inserted, and below it cut a longitudinal sort to fit over the skate runner. A screw in the top of the block is used to hold the file rigidly in position. Draw the skate through the slot, against the file, or fasten the skate to the bench or in a vise and draw the file over the runner, as shown.

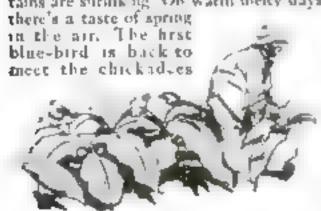
(Company on page 11.5)



T'S ripering time down South. On gentle hillsides where soil conditions and climatic conditions are in proper tune with each other, the tobacco—is ready for harvesting. Under the blazing sun the matured plants have been taking on shape and tint. The blades have been broadening, growing rich with the strength of the earth. So now workers harvest the crop from the fields, and bear it to the barns for curing.

It is cured slowly by a heat that is regulated to match the weather. The result is such tobacco as no other part of the world yields—strong in perfunc, gentle in flavor, alluring in color, and in texture like taffets sox.

It's thawing time up North. The drifts in the valleys of the Green Mountains are shrinking. On warm melty days.



that have been away and the melody in his red breast makes him forget the frost-bite in his toes. They have tapped the maple trees. The clear sap dript into the pails. In the boiling potathis sweet juice, which is the very essence of the New England groves, is being turned into firm, brown cakes. It hasn't been duied with chemicals, not doctored with flavoring matter or coloring matter. It hasn't been cheapened with admixtures of any coarser sweetening. It's the honest maple syrup, unadulterated and perfect.

This year's maple sugar, with nothing



added to it and nothing taken away, in brought to where the pick of the tobacco

of three 'years ago or four or five even, has all this time been ageing naturally. It's vintage to be cooky now.

By a process which has had the endorse-ment of smobers all over the world for forty-seven years the prepared leaf is

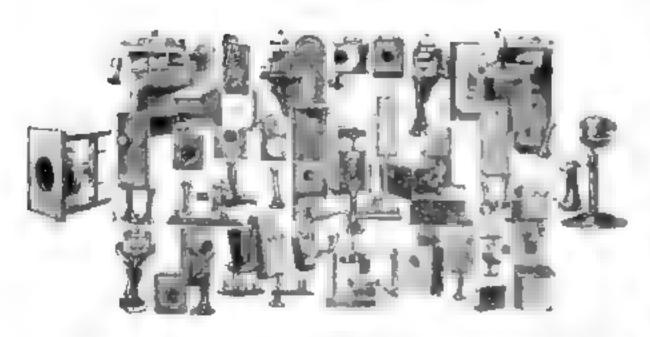
That practically is all just a mellowed, harmonious, aromatic, crusty mingling of the two F F. V's—the Finest Flavor of Vermont, the Finished Fragrance of Vermont.

And you have the Sweet Caporal Caporal Caporal Caporal isn't the true North-and-South blend, the real National Brand, what is?

Thank you. In I Cola

P.S. I write an article like this every outs in a water. Watch for the write. I know declined propositions to turn out advertisements for working manufactured products because I feel I merely would be a kneed hand, explaining this, that or the other thing for a much a ward. But I reached for this opportunity. I knew I could put my heart in it—could with the course endows the article I was praising.





An Account of Stewardship

FIFTY years ago Dr. Alexander Graham Bell was busy upon a new invention—the telephone. The first sentence had not been heard; the patent had not been filed; the demonstration of the telephone at the Centennial Exposition had not been made. All these noteworthy events were to occur later in the year 1876. But already, at the beginning of the year, the basic principle of the new art had been discovered and Bell's experiments were approaching a successful issue.

The inventor of the telephone lived to see the telephone in daily use by millions all over the world and to see thousands of developments from his original discovery.

If he had lived to this semicentennial year, he would have seen over 16,000,000 telephones linked by 40,000,000 miles of wire spanning the American continent and bringing the whole nation within intimate talking distance. He would have seen in the Bell System, which bears his name, perhaps the largest industrial organization in the world with nearly \$3,000,000,000 worth of public-serving property, owned chiefly by an army of customers and employees.

He would have seen developed from the product of his brain a new art, binding together the thoughts and actions of a nation for the welfare of all the people.

AMBRICAN TELEPHONE AND TELEGRAPH COMPANY AND ABSOCIATED COMPANIES



IN ITS BEMI-DENTENNIAL YEAR THE BELL SYSTEM LOOKS POR-WARD TO CONTINUED PROGRESS IN TREEPHONE COMMUNICATION

Cash Prizes ın

of book for details

Let Boice Help You Build It!

He offers you a complete line of discounting brack machines with higher quality and lower prices than ever before. Write for 64 page brother containing bright, information, and describing Boice-Crant Brack Circular State, 14 tack Bond Saw He Sawn Lackes, Ordin, Jointers and Mortiner.

6 Inch Bench Luthe Terms want and safe metal. Swings & in. of ever land. Capacity 20 in failurem centers working therein follows with its saw. Swings & In. marrimon.

allde Iru. Eft H. P. Matter \$11.09 riconiar may and much due attach-Physician make, now 118 W. In epole physics ph. a. C. That R. P. M. What sord, plug and 1 X in that is planted pulley. Branch Brancacht. and arbur for ments, J to scrull rhuck Jacob's chuck and art grittling ur buffing wheele.

1'S H. P. Motor \$13.05 Both motors grainest total 100 our cont. over-lend. The special effect our littled in two a-lar price type. Hode for manoriman operate, more freeze f. s. is Tolaris Cants with artis-tic field action grainestics.

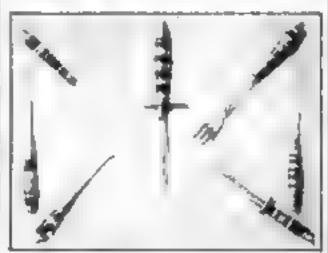
Dopt. P. S. I B. Toledo, Oble



The Home Workship

Ornamental Cutlery Handles Made from Odds and Ends

IN THE winter, when my farm dutles give me aufficient lemure, I make ornamental cutlery of the type illustrated below. Some are made from cold-rolled steel and others from tool steel, heated, hammered out, and dressed with a fine



From 65 to 100 washers of contrast ng morerule form the handles of these unique pieces

file and emery powder. The entire length of the handle end in threaded

The handles are made from thin pieces of various woods, brass, copper, gluminum, and celluloid of different colors The first piece is metal and fairly heavy It is tapped and screwed on. The other pieces, except the one at the very end, are put on like washers. The and piece serves as a nut to draw the parts together,

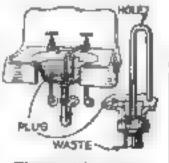
The handles then are dressed and polished. The number of pieces used range from 65 to 100, depending upon the thickness.—HORACE A. MARWOOD.

Washing Photographic Prints

WITH the addition of the special stopper illustrated, the bathroom layatory becomes a satisfactory printwasher. The water containing the hypoa drawn off from the bottom.

A wooden plug is made to fit tightly in the drainage hole. A siphon, made from a piece of copper or brane tubing 14 in In

inside diameter, is inserted into the This conplug. nection must be water-tight. The riphon is bent so it is not quite the height of the overflow outlet, and the shorter arm is about 1/4 In. from the bottom of the



The special scopper

basin. A small bole about 1/16 in. is drilled through the siphon at its highest point.

When the water is turned on slightly, the basin fills to the level of the hole in the siphon. At that point the action begins. Should the inlet flow exceed the autlet flow, the water merely passes out through the overflow, but if the water in turned off, the action stops.

A similar but larger device may be employed in a stationary laundry tub for washing quickly and thoroughly blueprints and other large prints.



DECORATIVE and beautiful as this chest of drawers is, the construction is of the utmost simplicity. There is not a single difficult joint-not even a rabbet or a grouve, the case is put together like a nox, with butt to rite and na is, so that a beginner can build it. In that respect It is unique, for in no other piece of surniture of equal style and appearance, so far as it is known, has such an ingeniously simple method of joinery been used. The details are contained in Blueprint No. 38 hated below

Complete List of Blueprints

NY one of the blueprints listed below can be obtained from POPULAR SCIENCE MONTHLY for 25 cents. The Editor will be glad to nuswer any specific questions relative to tools, material, or equipment. Blueprint Service Dept.

Popular Science Monthly 260 Fourth Avenue, New York

GENTLEMEN

Sund me the blueprint, or blueprints, I have underlined below, for

| which I inclose | 0 | ents: |
|---|---|--|
| 1 Sewing Table 1 Sewing Table 2 Send Table 5 Kachen Cabinet 6 Kachen Cabinet 8 Shaving Cabinet 9 Arbor Gate and Sesta 10 Porch Swing 11 Sent hand Tit Table 12 Electric Washer 13 Tee Wagon 14 Christman Toya 15 Workship Sence 16 Inlant Radio Cabinet 17 Ceuar Chest 18 Phone Table and Stool 19 Grandfather's Clock 20 Fat Top Desk 21 Coloniel Desk 22 Cabinet and Desk 22 Cabinet and Desk 23 Cabinet and Desk 24 Gateley Table 25 Can e Sating Outfit 26 Ship's Crib and Pen 27 Kichen Cabinet Table 28 Pulloan Play Table 29 Toy Tea Cart etc 30 Tool Cabinet etc 31 Sewing Cabinets 32 Cuitere Game Table 33 Dining Acces 34 Garden Trebnes | Palifiched Feb. 131 Mar., 192 Apr. 24 May 21 Jone 12 Jone 12 Peot 12 Peot 12 Peot 22 Jan 23 Apr. 24 Apr. 24 May 24 May 24 | 7 |
| 28. Pulman Play Table 29. Toy Tea Cart etc. 30. Tox Cubinet etc. 31. Sewing Cabinets 32. Cuitese Game Table 33. Dining Accese | Nov. 21 Dec 15 Jan. 24 Feb. 24 Mar 24 Apr 24 | 25c 25c 25c 25c 25c 25c 25c 25c 25c 25c |

Name

Please prince

Street

City and State



And then he knew!

"THIS was the second dance in a month, and both times the rurls seemed to avoid him. And as he sat alone, hidden by the drapenes, he had heard them talk about him. He decided right then what he would do about it!

A great many men are inclined to have a grimy-looking skin, spotted with blackheads and dull in appearance. Few realize that this hinders their success in life. Pompeian Massage Cream helps you overcome this handicap by giving you a clean, ruddy complexion.

Clears the Skot: Pompeian Massage Cream thoroughly cleanses the pores. It helps clear up backheads and pimples by stimulating healthy circulation, and by keeping the skin clean and the potes open,

Easy to Use: After shaving or washing, rub it in gently. Continue rubbing and it rolls out, bringing with it all the impurities. Result - a clean, healthy skin with clear, glowing color

Special Introductory Offer 13 of 60c per for 10c.

For 10c we send a special Trial Jar containing one-third of regular 60c contents. Contains sufficient Pompeun Massage Cream to test thoroughly its wonderful benefits.

Positively only one jar to a family on this exceptional offer.

YOUR DRUGGIST HAS IT

There's cothing quite to effective an doing the job yaursell Use Pomperan Mailsage Cream regulusty ut homethen you'll get the full benefit.



| The Pompean Co., Cleveland, C., Dept. 4 | 3 |
|---|----|
| Gentlemen: I enclose a dime (10c) for } | 4 |
| of a 60c jar of Pompeiun Massage Crean | 1. |

Name

Address

City

Stare



speakers is to appreclate at once why Amplions are the largest selling radio reproducers throughout the world-favorites of music lovers in all lands.

The actual originators and oldest makers of loud speakers, Alfred Grahum & Co., London, England, evolved The

quent testimony to Graham's more than thirty years' experience in sound reproduction.

Bring out the full musical quality of your set with an Amplion loud speaker or console unit. The prices are \$12 to \$42.50. Write for the "Amplion Pedigree" and dealer's address.

THE AMPLION CORPORATION OF AMERICA

Executive Officer Suits M 140 Madium Ave., New York City Canadian Distributors: Burndept of Canada, Ltd. Toronto.

Associated Companies and Agents Afferd Cenham & Co. London, England, Patentees, Amplion Corporation of Causila Limited Terreto Companier Francisco Amplion, Paper Francis I continentale Amplion, Project Beign in; Amalgamated & treles Australiana: Ltd. Sydney and Methodenie British Control Electric Companier, Etd., Johanneshing and Beanches, Indian States and Eastern Agency, Bombay and Calciusts: C. J. Christe E. Higo, Bourne Agent. Devol. 9 afface & Co., Valpagano, Mestre & Blatge, Ricide Janeiro; F. W., Essemmond & Lumpany, Landon and Tokes.





Earn \$1250 a Day!

That's What Kulp of Ohio Averages



Largest aspectatorer in world selling spectacles direct through agents. Write for BIG NEW PLAN. Million dollar concern just going into the Agency

True-Fit Optical Company Evans Bldg., Sts. C, Dest. T-147, Chicago, Ill.

THE HOUSE TWO IL SLOP

Could You Whittle a Broom with Your Pocket-Knife?

By Herbert L Childs

FOR one who has a keen pocket-knife and knows how to use it, it is no trick at all to whittle a whisk-broom. It is a good project for the whittier to try occasionally, when he has an odd half-hour to spare, as a test of his ability to make clean, thin, slicing cuts, and it makes a nest demonstration by which the bome worker can display his virtuosity with a penkude.

There are so many kinds of wood one may choose that it is difficult to say what kind is best. That used for making the broom illustrated was white birch.

Have the stock free of knots, about 16 in, in length perhaps and 1 % in. in diameter Allow plenty of room at une end so that you can hold the swock firmly.

Start about 6 in from one end, cutting with the grain Cut a strip about 8 ln. in length, stopping about 2 in. from the other



Two stages in making wooden whish broom

end. Cut as many more as you can, going completely around the stick. These you must bend backward and hold against the bottom end of the stick. Then repeat the operation until you have cut enough to make a broom of the size you wish. The slivers then should be bound tightly against the 2-in, end of the stick. Cut off the handle to suit the fancy and trim the brush end evenly.

Till is the third article by Mr. Childs, one of the foremost authorities on whittling. The first appeared on page 80 of the September, 1925, issue and the second on page 82 of the October, 1925, fasue.

Splicing a Broken Torque Tube

WHILE working on a portable sawmill, the torque tube of my Ford truck broke. As no replacement was to be had. I made a temporary job by cutting a piece of 234-in, pipe about 10 in, long

BREAK IN TORQUE TUBE THIRE " MYETS

> Repair made with pipe and riveta

and placing it in the end of the broken tube. Holes were drilled through both tube and pipe. A shaft was placed inside the pipe, and pipe

and tube were riveted together with rivets made from large spikes. remaining piece of torque tube was forced over the protruding end of the pipe and riveted solidly in the same way. -OSCAR M. ANDERSON.

Tie Home Workshop

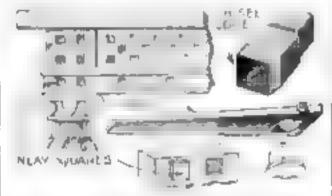
Quick Method of Making Inlays

By Roy L. Gerding

NLAYING homemade furniture generally is considered by the amateur woodworker to be a tedious and somewhat difficult Job. I have been experimenting with various methods and have developed an effective way to make inlave that does not take much time.

You will need four or five church of special design. These are made from square and hexagonal socket wrenches of different sizes. For 3a in back the lower edges should be ground or filed to about the thickness of a hacksaw binde. The edges then should be ground like chuels and honed as keen as possible on an oilstone. A handle of some sort should be made for these hollow chisels, a simple type being ulustrated.

The inlays are cut from pieces of wood planed to 14 in. or less or from scrape of thick veneer, if available. The cutting should be done on a heavy block of wood



Hollow chies) guide of socket wrench, the chief handle, and the simplest type of inlay

gawed aquarely and placed end up. A punch is needed to knock the inlays out.

The recesses for the inlays are outlined with the same chuck and the waste wood is removed either with an ordinary cheef, a bent woodcarver's chisel, or a chisel made from a broken backsaw machine blade or an old file

When the inlays have been festened in place with the best grade of liquid glac, they can be placed and scraped flush with the surface or allowed to project a trifle to give a relief effect, as in the overlays that are now so popular.

This method of inlaying is adapted especially to designs of odd or Oriental variety. A surprising number of patterns may be made by combining the pieces cut by different tools. It is well to draw a few combinations before deciding on the one to use for ornamenting any particular piece of furniture.

An Oriental table may be made by enamedag the wood jet black and ornamenting it with Inlays colored pearl gray, enlivened in places with touches of blue The blocks are painted with artist's oil colors, which come in small tubes. The painting should be done before the blocks are inlaid and the colors later given a protective coat of clear varnish.

This method of inlaying can be used to advantage on radio cabineta, footatoola, chairs, and many similar articles.

When y-o-u buy BROWN & SHARPE

Tools

on Utility alone

you are buying for the same reason that all classes of mechanics prefer these fine Quality tools the world over --- because the tools *profit* the user

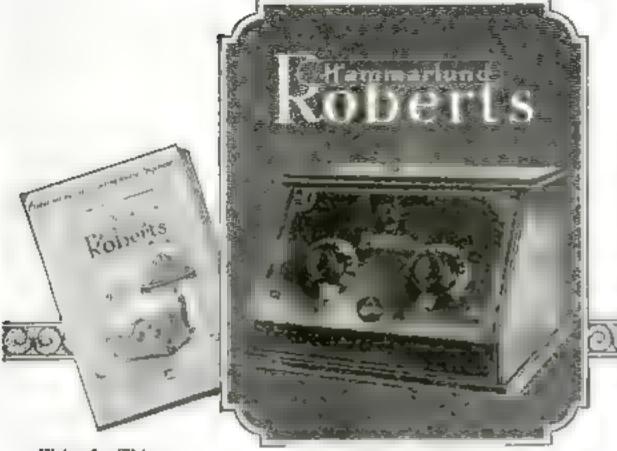


Brown & Sharpe Mfg. Co. Providence, R. I., U. S. A.

Whether toolmaker, mechanic, machine operator or motor service man, there are tools in the complete Brown & Sharpe line for every need -- tools necessary for the best work

If you haven't a copy of our Small Tool Catalog just ask for one at a good tool store - - - or we'll send a copy direct. It will profit you to keep a copy at hand.

"Standard of the Mechanical World"



Write for This "How to Build It" Book

Fully i lostrated throughout with complete information on amenabling wiring and aperation.

25c

ASSOCIATE MANUFACTURERS

All Adwitten Rudio Carp.
Alden Manufacturing Co.
Rudial Company
(Amperior)
Carter Rudio Co.
I'm in Rudio Corp.
International Newiglance

Co. Inc. (Durfrant Benfatorn ') Westingtoner Micaria Desiring and Min Con-pany, Inc.



Thin factors out instrument and other parte shown are some of the famous up to used a the Hammersund-Roberts.

Every Part Designed by a Specialist

VERY single unit that goes to make up this remarkable receiver was chosen by a specialist After months of research. The transformers were relected by an engineer familiar with every reliable make, the condensers by a man who had made a special study of condenser constructions and functions. So it was even with the smallest, usually neglected units.

From the work of these angineer-designers, backed by the endorsements of ten famous radio parts manufacturers, comes the Hammarlund Roberts, a receiver that is truly the ultimate in five-tube possibilities. The equal of a standard eight-tube and operation that anyone might construct it Priced amazingly low, the Hammarland Roberts offers the greatest value possible in the radio field today.

Complese Pares, less Gabines, 360.00

HARMARLIND-ROBERTS, 1882-F Brendway, New York, City









If you are the type of dealer who hastless after beginness, who for a content to wait for trade to come in but who takes sets out to demonstrate, can talk and sell quality merchanduse and known Radio values, we have a hig proposition for you. Are you that dealer?

50% Discount to Dealers



We manufacture a complete line of high goods receivers and nell to dealers at 30 per cost diseased. We are the fibelious for more than 1th Mathematical water for manufacture of one, new 110-page metalog and ordered lines. Write today for emanding offers, new 110-page metalog and regular manching mixing gravitarities of the complete particles on the state of the dealers of the complete particles on both too dealers of the complete page of the complete of the complete page of the complete of

American Radio Mfg. Co. 1862 Sed, Spt. I, Law Cy, St.

SEND NO MONEY 2 Genuine Diamonds 4 | 100 Each

Toron II desired

(G to Pay) Outside U. S. cash with order A by White Cold Top Cold Emblem may Ledge? of \$2.7 forted the English Yellow or White Cold, belled to



HOPE RUBY Alm, to Block Guyt.

be coul for benert time This -Ein- Hen Trade Mark

Beel for from Ealthing 加速化成果物 Buffale Joseph Mity, Co., "The Mail Order House" Dept. A \$81 Washington St. Buffale, N. Y. Dopt A

We Home Workshop

Neat House Number Sign Is Visible at Night

VOU are groping your way along a dark street, trying to locate the home of a friend who recently moved. You have no idea how the numbers run, but suddenly you see a lighted window against which appears a nest sign. This is cut out so that the light shines through in the form of figures the very number for which you are looking.

Seeing the advantage of such a house number, you may wish to make one for your own home. Packing box lumber will do very well. A good size for the

main piece la 🔩 by 5 by 201 g in Lay this on a piece of wrapping paper and mark around it. Cut the paper on the line and fold the prece in two, so that you can lay out an ornamental curve for the ends. By cutting



The number sign to hung before a window

with the scissors, both ands will be symmetrical. Also lay out the figures on the paper, choosing a style that can be cut out easily, such as one having the circular terminals, which can be made by boring. Cut out the ends and figures with a coping or seroll saw.

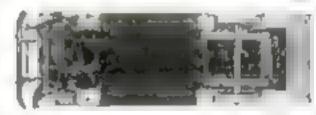
A piece % by 114 by 24 in. In cut in half to form the two supports. These are recessed 34 in. deep where the number piece crosses them so that the sign can be nailed together with the outer surfaces of

all parte flush.

Give the whole a coat of light paint and hang by means of screweyes and chain in front of a window, side light, or glased front door. Many original and attractive variations from the design lliustrated are possible.-W. W. WHITE.

Realistic Toy Fire Truck Made from Scrape

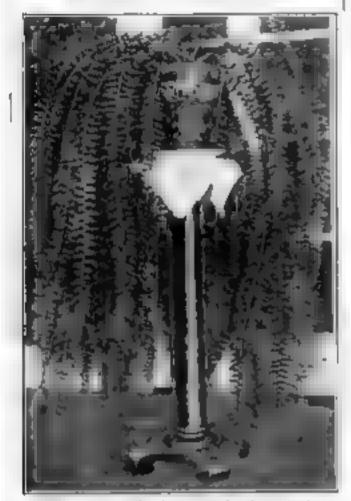




WHEELS from an old carpet sweeper, steering gears from a discarded sewing machine, and scraps were utilized in making the toy fire truck illustrated. It is 26 in. long, 8 in. wide, and 8 in. high. It weighs 20 lbs. and will support a weight up to 300 lbs. The metal-working tooks used were a post drill, files, and a hacksaw.-Warren D. Paris.

Graceful Turned Stand for a Jardinière

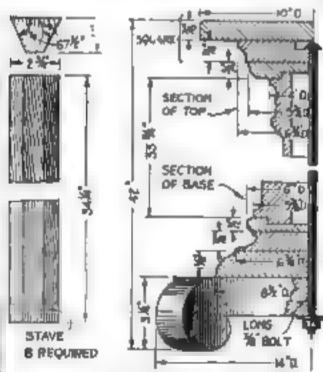
By William J. Edmonds, Jr.



An programmed plant stead the round pedeated of which is built up of eight staves

ONTRARY to the first impression conveyed by the accompanying photograph, the construction of this plant stand is not beyond the shility of the average amateur woodworker who has necess to a lathe.

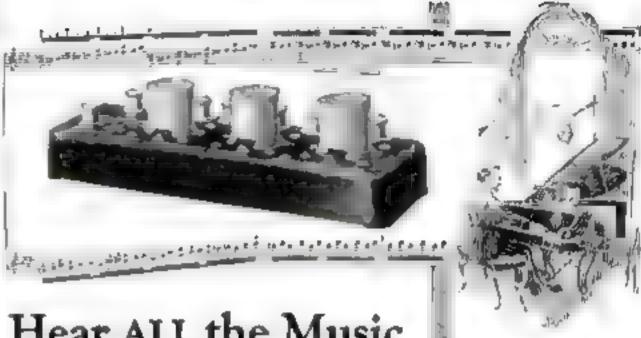
The column is built up of eight cermenta, as shown in the drawing. These are made slightly longer than the dimensions given and are glued up edge to edge to form an octagon. After the give has bardened, this column is made circular



Due of the stayes and a sertion showing the construction and profile of the podestal

in shape with drawknife and plane. Two octagonal pluga are fitted into each end so that the pedestal may be placed in a lathe and turned to the shape indicated.

(Continued on page Wi)



Hear ALL the Music with the Bradley-Amplifier

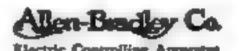
THE delicate variations and shadings of instrumental music and the exquisite strains of the vocalist, are amplified with faithfulness and clarity by the Bradley-Amphilier. It matters not whether you own a factory-built set or a home-built receiver, either will be improved by using the Bradley-Amplifier.

Bradleyunit registors, that are impervious to moisture and unaffected by atmospheric changes, take the place of the audio-frequency transformers of ordinary amplifiers. There is no distortion and no loss of low or high frequencies. All tones are reproduced with equal facility. As a result, the low notes of the piano are greatly improved and the high notes are not choked or distorted into a metallic sound. With a good loud speaker, the Bradley-Amplifier produces a marked improvement in tone quality.

Ask your dealer for the Bradley-Amphilier today, and substitute it for your present audio-frequency amplifying transformers. Resistance coupled amplifiers are acknowledged by radio experts to be the most perfect type of amplifier. You can make your set perfect with a Bradley-Amplifier.

Retail Prices:

In U.S.A., \$15.00 • In Canada, \$21.00



waukee



coasta.







Can be bounted within suba-calence, I X rules as well as and rubes can be used.

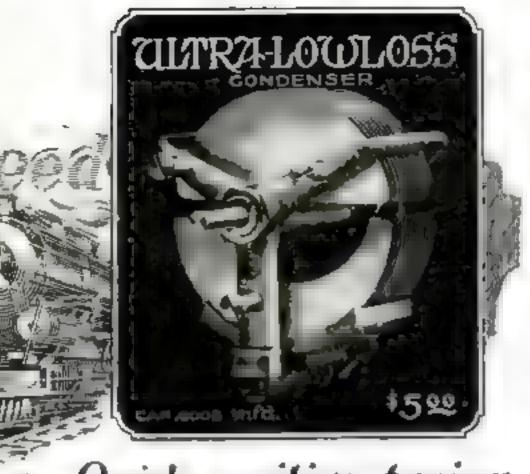


All removes, condensers and penalty are non-rained within the compact Babelite have.



Bradleyunit resider le made af roled muided material which does not change with age. All musts soldered,





Quick, positive tuning

and prompts



Minightles radio (unital, from 3 record a statute and the dial scherest statu-ply on a the finite to your proof much and you your proof mark and you got that attacked instantly, East a quick to materity, Education of a back to the guessian A single version A single version of Paraginari cleaker or and its levies in gold or plying finish.

541 rer, \$1.00 Cald, \$1.50

Speed-ability to turn directly to any station, to tune-in instantly and get your station without interference from broadcasting on similar wavelengths-is the outstanding feature of the Ultra-Lowloss Condenser.

With one station of known wavelength located on the dial, all others can be found instantly. Special design of Cutlass stator plates distributes stations evenly over the dial-each degree on a 100 degree dial represents approximately 335 meters difference in wavelength.

In addition, losses common in other condensers are reduced in the Ultra-Lowload to a minimum by the of only one small strip of insulation, by the small amount of high resustance metal in the field and frame, and by a special monoblock mounting of fixed and movable plates. Designed by R E. Lacault, E.F., originator of the famous Ultradyne receiver and Ultra-Vernier timing controls.

At your dealers, otherwise send purchase price and you will be supplied postpaid.

CUTRA-LOWLOSS

CONDENSER

PHENIX RADIO CORP., 114-A E. 25th Street, NEW YORK



Wanted

We require the services of an ambitious person to do mone special advertising buck stains to your you locally. The work is piresent and distilled. Pay is exceptionally large is required, as all that is necessary to a utilineness on your part to carry out our instructions. If you are at present employed, we can imp your space time in a way that will not interfere with. long pass.

Long beared embydates: het het les gegren ge.

your lines. If you are making him them \$150 a month, the effect I am going to making him them \$150 a month, the effect I am going to make will appeal to you. Your pour time will bring you his a handware indexes. Write me hodey and I will send you full particulars by justice mail and place before you the facts so that you mail and place before you the facts so that you mail such that for yourself.

4936 American Bidg., CINCINNATI, ONLO.

Godzaliew Smoli

Kitchen Ceiling Vent Carries Off Fumes of Cooking

VENT above the gas range for draw-A ing off steam, amoke, and cooking odors has come to be a real necessity in the modern home. . An improved "amoke catcher" for a bungalow or any house where the space above the stove corner of the kitchen is not otherwise utilized, may be constructed as shown below.

The ceiling joists above the kitchen chimney flue are cut away to make a equare opening about 4 by 4 ft. The loose ends are braced with a header. A vent box 8 by 8 in. is placed 8 in. higher than the top of the ceiling joists. Con-

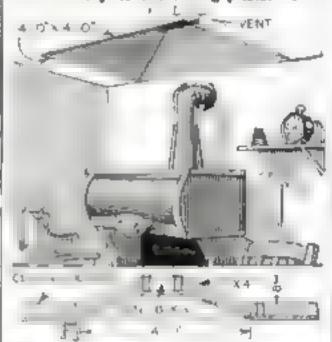


Diagram abowing the general arrangement of the onling year and a closs section

necting braces of "two by fours" are run from each corner of the vent box to the plate. These support the wont and carry the lathing. Additional braces may be used if desired. The recessed portion then is inthed and plastered or finished with wallboard like the ceiling.

Nall screen wire over the vent box from above and connect it, at any desired angle, with a galvanized iron roof yent by means of another box of rough lumber 8 by 8 in.

As the ceiling vent is placed at the highest point above the stove, the greaty smoke and fumes pass upward through the acreen and then through the bex to the roof — A. MAY HOLADAY.

Graceful Turned Plant Stand

(Continued from page 89)

Note that there is a tenon on each end. Instead of turning the column with straight sides, it has a slight swell from the base to about two-fifths the height, where it begins to curve in toward the top. This gentle curve is to overcome the optical illusion of slight concavity that a straight-line profile would have.

The remainder of the construction requires no explanation, excepting that a long 5x-in, bolt or a rod threaded at both ends passes through the center of the different pieces and when tightened keeps all in place.

The pedestal may be finished so the taste of the builder dictates, preferably with varnish or wax.

New Handkerchief Vanishing Trick

By Kenneth B. Murray





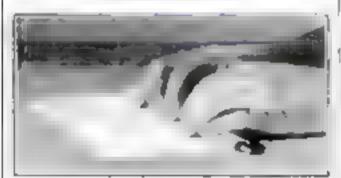
How the handkurchief is stamped into the come, and the venish se the performer sees it

OF THE many methods for vanishing a handkerchief, the one pictured above is perhaps the essiest for the amateur to master and, at the same time, It is one of the most spectacular

A small sick bandkerchief, preferably bright red, is placed in an unprepared puper cone. The magician atampa the bandwerchief into the cone with his magic wand and, as he withdraws the wand, shows that the handkerchief has disappeared

The secret hem in the construction of the wand, which is hollow In the wand is a

3 and weren on Juge 92)



The super wand is rolled about a peach



Coloring the tube with waterproof paint



The book and thread drawn out from the wand

SARGENT

PLANES



Be sure the planes you buy come up to Sargent standards

You may never have to put your plane to the tests that most carpenters give theirs. Nevertheless you want your work to have the finish that only the best of plenes can give. The same qualities that make Sargent Planes. the choice of carpenters should govern your selection.

Sargent Construction: Wentresisting materials are used throughout. Chromium steel is used for the cutters-an unusually tough metal that takes a keen edge and holds it.

Sargent Performance: Absolute rigidity of cutter, even across and against the grain or over knotty surfaces. Adjustments quickly and easily made. In the Sargent Auto Set (the larger plane illustrated) the cutter can be removed, sharpened and replaced without changing original adjustment.

Sergent Economy: Sargent Planes are moderate in cost and prove a real aconomy by improving work and saving time. Seldom if ever do they need repair or replacement.

The two Sargent Planes shown here should be in every home and school workshop. See them at your dealer's. Write for booklet.

SARGENT & COMPANY, Manufacturers 50 Water Street New Haven, Conn.

Make More Money Opportunities on pages 129 to 150 of this issue.

Read the Money Making

DIRECT AT FACTORY PRICES - This \$2 Knife \$1.18 Postpaid



makes this imple this limited property. In this limited property for the formal property for the property for the property formal property formal property formal property formal property. waitenhund.

Sumple \$1.15 3 for \$3.00 Pastpold

Send for our 100 page List and FREE

MAHER & GROSH CO., 219 A St., Tolede, Ohio



SIMONDS HOME AND FARM SAW

Repairs to be made—odd jobs to be done—that is the call of Spring. So Spring calls for Simonds Home and Farm Saw with teeth that bite their way amoothly and easily through the toughest board. In the Home and Farm Saw, Simonds has produced a cutting tool worthy of the name. Confining manufacture to one size-24 inches long—Simonds is able to offer the Home and Farm Saw at \$2.00—a price that is actually less than you shought you would have to pay for anerdenary saw. Ask your hardware dealer about this new today.

SIMONDS SAW & STEEL COMPANY Fitchburg, Mass.

"The Saw Makers" Established 1832 Branch Storm and Service Shops to Principal Cities

KNIVES STEE FILES

Riding an Ice Chair Is Novel Sport for Skating Parties



WHEN the los is thick enough for skating, you can have a lot of sport by equipping a common folding camp stool with runners to form a skater's chair. The runners, which are strap fron or even wood, are bolted to the legs of the

The occupant of the chair alta with his or her skates directly in front and must grip the chair firmly so as to present a stiff back to the one who is pushing from behind. When not in use on the pond, the chair can be used near the edge by those who wish to rest or remove their skntes.-G. EVERETT VAN HORN.

Handkerchief Vanishing Trick

(Continued from page P1)

small book tied to a 14-in, length of pencil. To this book is fastened a strong black silk thread, which runs through the wand and is tied to a black button on the magician's vest.

The book lies near the end of the wand. that is used to stamp the handkerchief in the cone. During the stamping process the handkerchief is exught by the hook and then it is drawn into the wand by a movement that carries the wand away from the body. This movement, while appearing perfectly natural to the audience, causes the thread to pull the hook from one to the other and of the wand and draws the handkerchief out of sight. The black thread cannot be seen at a distance by the audience. The ciothes of the performer, of course, should be dark in color

After the "vanish," place the wand with its contents in the inside coat pocket, at the same time attracting the attention of the spectators to the paper cone, which they should be asked to examine. If they wish to see the wand, hold the handkerchief and hook by the thread and draw out the empty wand.

The wand is prepared by rolling a sheet of heavy typewriter paper around a pencil, gluing the edge, and coloring the tips with waterproof black paint. The short piece of pencil with the handkerchief book should fit tightly.





For SELECTIVITY and DISTANCE

Repardies of her good year act suches to be, you one make it many those more acteries and much make those more acteries and much make posteried by replacing yout T k P transformers with Acro Code, Get Acro Code now and tune through strong locals and bring in DZ with transdom look appealur volunte?

The parent of Arth Coils' marketly superior performance to the patential constitute in which makes possible the contract upon of M. are dislocted and depelors alrepted windings with the consequent advantages of least high frequency replatance and destributed expandly.

AT YOUR DEALERS OR DIRECT

Write for the Auro Bookist

AERO PRODUCTS, Inc. 317 N. Dooplaines Street, CHICAGO

Buys Any WITTE Latest Model



All-Fuel Engine # 10 H-P.

The Gas-Froit Lagina, Rold Bleest From Festary To Yes, Hang Terms on best engine built, Burns Karosena, Dis-Clista, Cass-Cul, Gassameor Gas. Change power at west. Equipped with the famous WICO Magneto, speed and power Perchater and three ling governor. It to It herespower — ALL STYLES.

FREE Write today for my Big Engine on your part. Or f Interested, ask for our Log and Type Saw. 3-in-1 Saw liggor Pump Cotalogs. WITTE ENGINE WORKS

2227 Witte Building, KANSAS CITY, MO. 2227 Empire Building, PITTSBURGH, PA



Popular Prisus—Romarkshiu Kusulin

No better longs of may price. Quantity production been prices low blandsome, convenient and officient Lincoln.

Lincoln Loop. Standsome to desired to vary the inductance of the loop. Receptionally Banfor Superhead Loop of the loop. Receptionally Banfor Superhead Lincoln Canyen-Tapped Loop . 28.10

For any set employing sades frequency amplification. For certain Singerhead requiring a center tap. If your desire cannot supply you, order it set a lying soon desire manner. Write for illustrated cashing PS

LINCOLE RADIO CORPORATION, Z24 N. Wells St. Chicago.

WADE BENCH



HB 1744W CHARGING (MIN 1150 F) 300 Will



527 -35 THE MONEY MAKING SERVICE WAS

The Mome Workschop

Discarded Cream Separator Converted into Forge

IN THE junk pile there is often some discarded machine that can be converted into a forge. In this case an old cream separator was used.

A fan was made and mounted in place of the howl, with a bicycle hub for ball bearings. The axle was connected with the high speed shaft and, as there is a friction clutch in the machine, the handle can be worked as a lever without turning

it all the way around.



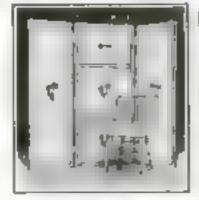
drum. The rope, which is earried from the drum over a sheave mounted high up. is tied to a large pail filled with concrete. The crank can be turned backward to wind the weight up and the weight then keeps the forge running for a time while tranwork is being hammered out

The apeed of the Inn can be regulated by the weight. The upper air intake on the fan case helps carry away the smoke

The tuyers iron for the fire pan is made from a 2-in, well pipe driving cap, crown side up, with a bolt set in it as a shaking handle. Four 14-in, holes were drilled in it to admit the air. - A. C. BRUNDAGE.

Canvas-Covered Frames Form a Decorative Screen

AFTER rebreakfast room sulte, I hunted unsuccessfully through the stores to find a folding acreen that would harmonuse with the furniture and at length built a acreen of my own design.



The screen is pointed to metch other pieces

The frames are made of 1 by 2 in. finished white pine, butt jointed, with steel angle chos inside each corner. These are covered with light canvas—muslin will do-sewn like a bag on a sewing ma-

Continued on page 94)



IT SAVES SPACE!

This straight line frequency condenser is a space-saver in the radio cabinet . . . It can usually be substituted for the old time condensem in existing sets . . . Once installed, it revolutionizes your ideas about tuning . . . Those Amsco half-a-heart-shaped plates add Kilocycles at the rate of ten to each dial division-giving "a station for every degree". . . All wavelengths—high or low on the scale—tune in with equal case . . . Amaco allocation of the stations is uniform and correct to within a fraction of 1% ... Insist on Ameco Allocating Condensers . . . Made in six space-saving models, three Single and three Slamese, at very reasonable prices.

> Amico Products, Inc., Dept. G Bruoma & Lafavette Sts.







OTHER AMSCO PAR

Write for our booklet, "The Heart of the Hook-sp" for full details and prices of the entire Assess line. Assect for





ADDS SUBTRACTS MULTIPLIES DIVIDES Does work of \$100 marbine. Guarantees & years. NOT A TOY

Made of steel and indestructuble. Million dellar caretransfer the property. Will not make twistakes. So simile child can oper ace! Every histy should car a h tetter (ste 2000000





Send No Monoy - Just name and orders. We will also Calculates immediately perfold. On delivery pay contrast \$2.50. If not equalled HISTORIAN STATISTED VANAL

AGENTS

This is the broad primed practical Calculation panels. Why part were for indexion panels. Corder from that set indexion panels of the panels of the



YOU will find it a pleasure to work with Pexto Tools. They are made from highest grade materials, parts that require strength are drop forged, cutting edges are of best tool steel properly heat treated, parts that are liable to wear are hardened, in fact, all branches of our manufacturing and selection of materials are carried on scientifically and each and every tool is carefully inspected before being packed for shipment.

The line consists of Bit Braces, Auger Bits. Squares, Chinels, Hummers, Hatchets, Phers, Monkey and Pspe-Wrenches, Angle Wrenches, Screw Drivers, Snips, Compasses, Pruning Shears, Dividers, Calipers, Pincers, Suldering Coppers and many other small tools.

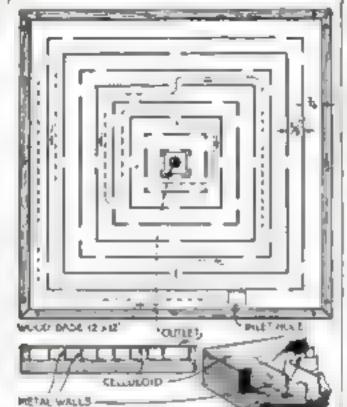
The Peck, Stow & Wilcox Co. Southington, Conn., U. S. A.



The Bome Workshop

Complicated Labyrinth Puzzle Can Be Constructed Easily

ABYRINTH puzzles exert a perpetual fuscination, expecially when they depart from the conventional and familiar designs. In the puzzle illustrated, a marble is inserted through a hole in the celluloid cover and rolled around the corridors until it reaches the center, when it can be removed. The problem is apparently an easy one to solve as there



Only one opening in each division to large enough to allow the marble to pass

PRSSAGES

are numerous openings, but the marble will pass through only certain ones.

The base is wood, 1/2 by 12 by 12 in. It is bordered with strips 14 by \$4 in., to which the celluloid is to be fastened The divisions are made of thin metal as shown, and are tacked in place. While each has four or more openings, only one gap is wide enough to allow the marble to pass. The others are a trifle too narrow, the difference of a hair's breadth being sufficient. It should be so nlight that it cannot be noticed by the player.

When the openings have been tested, the cover is comented and screwed or tacked in place.-Donald W. CLARK.

A Decorative Screen

A COUNTY OF THE PARTY.

chine. Each of the covers must be of a size to alip over the frame tightly. The open end then is lapped under neatly and tacked in place.

The canvas is coated with size composed of 1 lb. of give and 8 qts. of water As many coats are applied as are necessary to pull the fabric taut.

The entire surface of the panels then is given two coats of light gray waterproof enamel. The edges are bound with 34-in. gimp fastened with upholatery nails. Deaigns are stenciled on one side with oll-tube. colors to match the other furniture.

The panels are fastened together with double-jointed brass screen binges, which allow the ecreen to be folded in either direction,-J. P. HARDECKER.

BARGAINS In Rebuilt MOTORS



\$8.00 F 0. B. Chicago 176 and 1/4 H. P. A. C. &

D.C. 110 Volt

These motors have been taken in trade and thereugh-ly rebuilt in our own shops,

Many Standard Makes

Robbins and Mayore, Emmerson, Marathus, Congral Electric Westinghouse and other makes.

These meters are ideal for lathes, blowers onell drills, matchedd washing Stackston, cream separators, ventsletting fame, etc.

Every meter guaranteed to give perfect satisfaction or motory refunded (less return charges). Send cash

Complete line of new motors. Prings on all types

NORTHWESTERN ELECTRIC CO. 410-420 S. Hayas Ave., Dept. 2, Chicago, Illinois





Men to manufacture Metal Toys and Novelties. Good chance to start your own well has ng business producing such



big sellers as love Novelties. Ash Trays. Book-blocks. Souvenits, Advertising Specialties, Paper Weights, etc. We furnish forms with complete outfit for speedy production. Absomely no experience of tools necessary; no special place needed. Small investment puts you on road to success. Demand exceeds supply and we assist and co-operate with our manufacturers in selling their products. We put you in touch with the huyers and assure an outlet for your goods. Strictly a business proposition and thorough investigation invited. A splended opportunity for an entermous and profitable business for ambitions men. others need apply. Calsing and information mailed on request

METAL CAST PRODUCTS CO.

Mrkshop Workshop

Gumption with Tools

(Continued from page 73)

auger, and a saw, and he could make a river raft, a corduroy road, post-and-rail fence, a barn, a hen coop, a pig sty, a dog house, a church, a fort, or a village, and these atructures would be more substantial than similar atructures of today,

But, to these three tools the men of yesterday added that great quality that is produced by the frontier and has enabled us to hore through mountains, to bridge over chasma, to go under and over rivers, to build the Panama Canal, to manufacture and operate steam engines, automobiles, flying machines, steam craft, sailing craft. Without it every invention of today and all the tools in the world are so much rubbish. That quality, that attribute of the mind, is GUMPTION.

IT'S gumption that made the Yankee notions famous; it's gumption that is absolutely necessary for a plainsman, a mountain man, a pioneer, a backwoodsman. He must possess it or die-

It is the absence of gumption that makes what we call a "chump" or a "boob," a "duffer," a "doodle," a "dizzard," a "nod-dy," "dunder addle," or a mollycoddle," according to the part of the country in which we live.

The Huck Finns, the Tom Sawyers of the river bottoms, the street gamins of the city, all have gumption. The old-time workmen possessed a phenomenal amount of gumption, but it seems to be sadly incking today

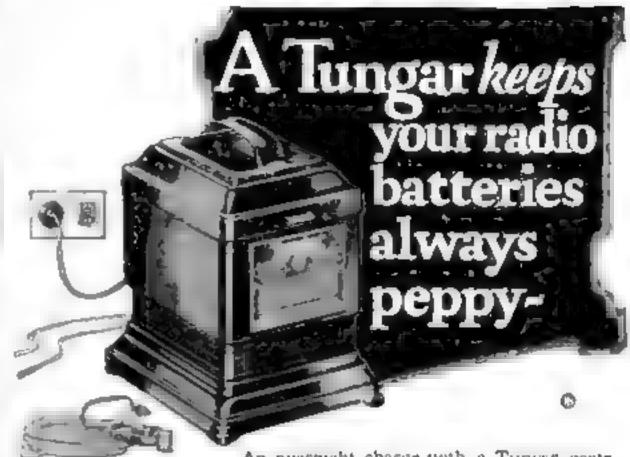
While eitting around the blazing logs of a camp fire in the mountains one winter night in company with Frederick K. Vreeland, electrical and consulting engineer, Col. David Abercrombie, the famous outfitter, Edmund Seymour, the banker and former ranchman, and other boon companions, some one naticed a lump, wart, of bunion, so to speak, on a white oak cordwood stick, which was about to be put in the fire. Such protuberances are known as "burls."

THIS burl was removed from the stock of wood by means of the camp are After that it was passed from hand to hand and modeled until it took the form of a drinking cup, or "noggin."

Dry oak wood is exceedingly hard and difficult to cut. These men, therefore, aron tired of using their hunting knives and searched for some better sort of a tool with which to dig out the inside of the There were no tools where we were camped, but one of the party found a rusty blade of a file near the site of an old barn. The end of the file was thrust into the hot coals and kept there until the metal was red bot: it was then hammered and its end made into the form of a hook. After this it was retempered by dipping the hot from into water; then the edges were sharpened on a stone.

With this hand made tool these wilderness men gouged out the maide of the burl so neatly that in some places one may see the light when it is held up to the sun.

Cantinual on page 96).



An overnight charge with a Tuncar costs about a nickel. It peps up both "A" and "B" batteries and keeps your radio set at its full-toned best.

Tungar - the original bulb charger - is nomeless. It contains no substance which could spoil furnishings. Just clip it to your set and plug it into the house current. It can't blow out Radiotrons if the battery is left hooked to the set while charging.

Use a Tungar—the charger that needs no attention.



Tungar-a registered trademark-to found only on the fenume. Look for it on the name plefe.

Merchandise Division General Electric Company, Bridgeport, Conn.

GENERAL ELECTRIC



The Tunger is a G-S

product developed in the Research Labora

for ea of General Lies

The new Tunger chur get unr make and size

of storage ballrey ta-

dio "A und auto bat terios, and B" batter-

les as high as 96 volts

Bast of Rockies

Two amperests \$18.00 Fire ampere ater \$20.00

la series.

Tool Cases 🗌

for Machinists, Carlichtets and Thot blakers none better, thurty styles Quartered oak and metal coreted. Ask for booklet. "Built for Service"

The Midget his agree than C. C. I profind to mingran were the stop falling care CO Hear, belieb.

GREEN, RED. SELLS FOR \$1.25. JUST OUT!



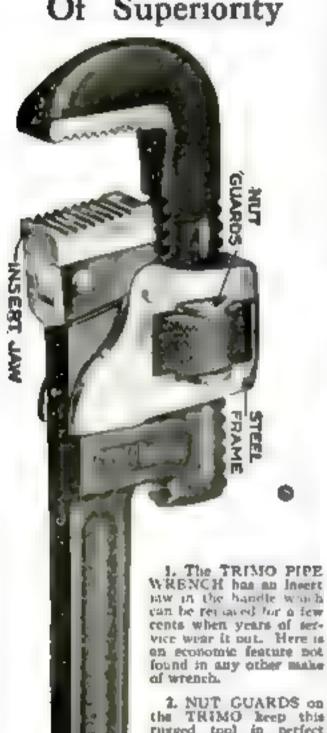
Labrenhable TRIO Self-Fifthet Fountain From Mona Cift Comes in Holly Ros. Guaranteed for 3 Vents, it makes carbon Copies. Money refunded if you do no. think it is he best pen you ever wrote with. Finished in beautiful gover, red purple or black. Send for whoseste quantity price that and distributing plans.

F. SPORS & CO.,

196 4th Street.

Lesueur Center, Minn.

Has 4 Points Of Superiority



- 2. NUT GUARDS on the TRIMO keep this rugged tool in perfect adjustment, a great conventence especially when working in close quarters.
- 3. TRIMO has a Steel Frame that WILL NOT BREAK, insuring great strength and your personal safety.
- 4. TRIMO is expectly designed which makes for basance, better work, longer life. are all FACTS not mere claims, but tangible things that you can see with your own eyes by inspecting the TRIMO at any mill, or, pumbing-supply of hardware store.

In eight STEEL handle sizes from 6 to 48 inches; in four WOOD handle inches.

TRIMONT MFG. CO. ROXBURY, MASS.

America's Louding Wrench Makers for Nearly Forty Years.

is love

Gumption with Tools

(Continued from \$444 95)

The noggin or drinking cup above described hangs by a thong from my belt on all my hunting and fishing excursions. It is beautifully polished and it has traveled with me from Florida almost to Hudson Bay, and from the Atlantic to the Pacific. It is the most serviceable and convenient personal drinking cup I over possessed and the only took used in making it were an axe, a hunting knife, and an old rusty file, but with these tools was mixed that wonderful ingredient called gamption.

Among the arms hanging on my studio wall are two great knives almost as large as a machete, which my brother picked up on the battle field of Fort Donaldson These knives were used by the Confederate soldiers and were homemade affairs fashioned from big rasp files.

For gumption and ingenuity in making emergency tools, I believe that displayed by Colonel Rose of the Seventy-Seventh Pennsylvania Volunteers was the most notable, when he planned and conducted the digging of the famous Libby Prison tunnel during the Civil War No toos were used, but spoons, old table knives, and a bit of hoop from.

IN FRONT of Vicksburg during its siege the U.S. Engineers were ordered by Grant to bridge a bayou. They set to work in a masterful and accentific manner, but- Well, the backwoodsmen of the Thirtieth Musouri Volunteers being idle, asked permission to try their hands at building a bridge. When permission was granted, one man swam across the sluggish current in the bayou and cut down a tree on its banks, at the same time another stalwart backwoodsman was making the chips fly from a tree at his

The two trees full, their spreading branches interlacing in the waters of the bayou. Then all the Thirtieth men got busy dragging branches and brush with which they covered the two trees. On top of this they beaped sods and dirt.

The U. S. Engineers ceased work on their bridge and gladly helped the brawny frontiersmen. In a remarkably short time there was a good road across the bayon underneath which the water slowly flowed through the branches of the fallen trees and over which the troops and artillery passed in safety and comfort.

TENERAL Andy Rickenlooper built a pontoon bridge across the Tennessee River of cotton bales and a few boards from the ruins of a cotton gin.

After taking a course of civil engineering and surveying at Worrale Academy in Kentucky, it was my good fortune to get a position under General Hickenlooper. While exting lunch at Bold Face Creek, in the southwestern division of the topographical survey of what afterward became greater Cincinnati, the General told me about that pontoon bridge

General Grant ordered a bridge

(Continued on page 97)



FOR CLEAR, QUILT "B" POWER



Aven Lans Indefinitely-Pays for Itself the manners and professional transport professional for transport by a heating of the control of the form of the f

WORLD BATTERY COMPANY
1219 So. Wabash Ave. Dept so Chicago, III.







Getting Ahead?

Read the advertisements on Pages 120 to 150 this issue if you want to get ahead!

Baltow Finolit and

Gumption with Tools

(Continued from page 90)

built. General Hickenlooper asked for a regiment of soldiers; they were given to him. He made a raid upon some contraband cotton concealed in the back country, and built a bridge as described, but he told me that when the artillery went over that bridge his beart was in his mouth, Each cotton bale, as a gun carriage struck it, disappeared under water and papped up again behind the passing caisson. This happened with every gun that passed over the bridge. Navertheless, the structure held together and the troops and artillery crossed in safety, although they did not make a dry passage.

THE Daniel Boones of our early history frequently lost the lockplus and screws that held their flintlocks on their rifles; the locks then were bound on with green rawbide. When this dried, the parts were held together tighter and safer than any screw or pine could make them; also they were repaired easily. I have one auch rifle now beside the

I also have at hand an air gun made by a janitor. The barrel is a brass tube from some piece of machinery. It is a wonderful invention. Without releading, it will shoot 50 or 60 times with great force and precision. The pump to it is worked so easily that a little child can operate the gup without under expenditure of effort. Every part of the gun is made of such fragments as can be found in a workshop, yet it is a better air gun than any I have

Recently I offered a budge of distinction to any of my scouts who could go into the woods, make his own tools, and with them fashlon a practical Indian arrow from the material found in the wood. Out of several hundred thousand scouts, one smashed a flinty stone against another stone, used a fragment for a knife, aplit and whittled out the arrow shaft, and then with the broken handle of a toothbrush, which he found in the path, he chipped a flint arrowhead. With a sinew from the body of a small mammal he had killed, he bound the flint arrow head to the shaft. He feathered the shaft with feathers found in the woods and glued them on with the gum of trees.

Alongside of this boy, Robinson Crosoe was a veritable tenderfoot, a "Cheechake." It is this indomitable will and ability to make use of the material at hand that we are inculcating in the minds of the Boy Scouts of today.

NOW the lesson taught us by these examples is, that with gumption a man can make almost anything, using only hand-made tools. It is the primitive, forceful quality of human mind backed and strengthened by modern education that produces our Fords and Edisons. This quality of mind is one of the most valuable assets we Americans possess. It means success in business, in the professions, in statesmenship and science, and it can be summed up in the good old fashioned word, GUMPTION



Slide Caliper Rule

A merful tool for door meanurements. For especially fine adjustments, the fittal movement of the thumb slide to made by turning the kentrled

adjusting nut. Reveesing the altde, the tool can be med as a stop rule. Removing the sixe provides a necrow hook rule. The tempored steel rule is 6 inches long, 14 inch wide, 1/20 inch thick, with either No. 10 or metric graduation. Packed one in a pastaboard box, weight a owners. Price \$3 50. Slide Caliper Ruie, No. 1771, without the fine screw adjustment. Price \$2.30.

Save money, time, trouble

The amount of effort and expense involved in repairs and replacements around the house - the car - the radio - often depends on the accuracy of your measurements.

Hair-line precision on close work, a snug fit for all parts you buy -such as gaskets, petcocks, washers, bolts, nuts, screws, keys, and pins - absolute accuracy of every measurement for which a caliper slide rule and a trammel rule can be used, is insured by these two vest-pocket-size tools.

These good tools will be mailed guaranteed, postage-paid, to any point in the United States on receipt of the price.

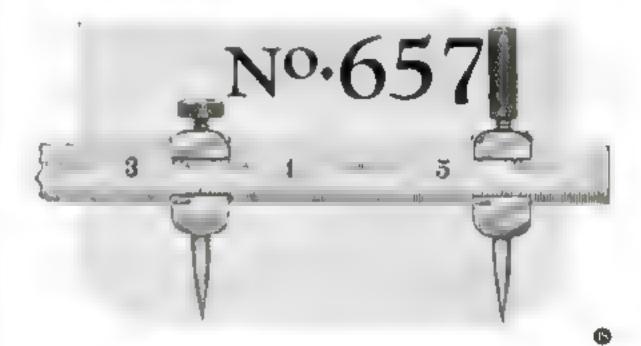
GOODELL PRATT COMPANY, Growfield, Mass., U. S. A.

Trammel Rule

A compact, handy tracemel for all measurements within the dipacity of the steel rule which forms the been. The hardened stud

points can be set directly from the graduations on the steel rule. When describing curcles the point at the left, with the flat cop, is used as the center, and the point at the right the acriber.

The tempered steel rule is 6 soches long, 3 n Inch wide end t 20 trich thick, with subst No. 10 or matric graduation. Packed one in a pasteboard box, weight 135 ounces. Price \$2.50.



GOODELL-PRATT 1500 GOOD TOOLS

"More precious than rubies"—seems this smoking tobacco

Old smokers of Edgeworth delight in their friendly rivalries for length of attachment to their favorite brand, and for total poundage incinerated in their trusty pipes.

Mr. Dugan inaugurates another sort of competition—a sort of Long-Distance-Wait Contest. For this loyal Edgeworthian orders his favorite tobacco in May, and then goes on lorage rations until August, rather than twist his tobacco taste to accommodate native; varieties.

Read Mr. Dugan's letter and be thankful you're where you are!

Philippine Islande

Larus & Bro. Co., Richmond, Va.

Dear Sire: - Enclosed please find moneyorder for \$4,65, for which please and money-the following: 1—15 or place and me Rubbeut 1—\$1.50 can gloon, 1—\$1.50 can Plug Slice.

Until recently I have been able to get Edgeworth from a dealer near here, but for the last month he has been int have been smoking native organistics and other no-colors tobacco. I traduct that it will be the colors as ay an better I scar from the a, but I know I get it more by sending direct to you, you want be just out." In the meantline I may be able to scare up a little nero and there. It a magnity hard to boom any E. geworth form hard to book any Engeworth from friends in this part of the works. They diget about an some rive you the key to their unfety deprois boxes no they would to the Old tobacco box where they keep their Edgeworth. I do not plane them, it a mighty hard to get, and it's ter bly hard to mighty hard to get, and it's ter bly hard.

to go without | know w the bally felt a of the map now a at he namey till be tony Edgeworth, Louis, a most teatfally,

C. P Dugan,

Let us send you free samples of Edgeworth on that you may put

it to the pape test If you like the maples, you'll like Edgeworth wherever and whenever you buy it, for it never changes in Write quality. your name and address to Larus & Brother Com-

pany, 10M South 21st Street, Richmond, Va.

EDGEWORTH

We'll be grateful for the name and address of your tobacco dealer, too, if you care to add them.

Edgeworth is sold in various sizes to suit the needs and means of all purchasers. Both Edgeworth Plug Slice and Edgeworth Ready-Robbed are packed in small, pocket size packages, in handsome humidors holding a pound, and also in several bandy inbetween sizes.

To Retail Tobacco Merchants: If your jobber cannot supply you with Edgeworth. Larus & Brother Company will gladly send you prepaid by parcel post a one- or two-dozen carton of any size of Edgeworth Plug Slice or Edgeworth Ready Rubbed for the same price you would pay the jobber.

Wallboard and Trim for Finishing an Attic Room

By Edwin M. Love

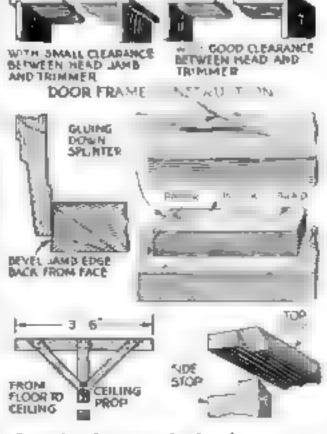
This is the fifth of a series of articles taibn# how to convert an unfinished attic into a comfortable room. Whether or not you wish to undertake a job of this kind, you will find invaluable pointers on home woodwork in each of the articles.

DECAUSE of its comparative cheapness and the case with which it can he applied, wallboard is especially adapted for use by the home mechanic in lining an attic room.

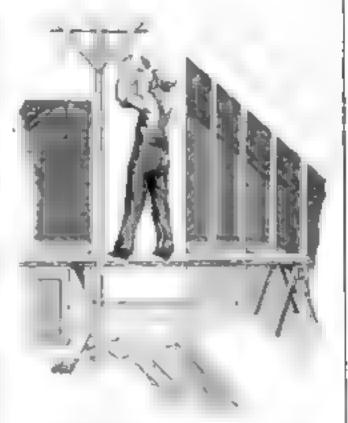
Much wallboard is applied over frame wals just as erected, but to avoid humps and hollows in the walls it is advicable to test the stude with a straightedge for straightness and almement. Irregularities may be planed out or shimmed, according to their nature.

At all angles and corners, blocks must be nailed between the rafters, ceiling joints, or studding, as may be necessary to carry the edges of the wallboard. Other backing blocks with their centers at the height of the baseboards, must be put in. Behind all light fixtures and outlets backing is required. This construction prevents pockets or sugs behind the

Wallboards fall into three classesthose consisting of a planter or composition core with fiber faces, those built up of parrow widths of this wood and faced with fiber, and those built up entirely of wood or cane fiber suitably compressed and treated to give rigidity with lightness. Each has its good points. The plaster board in fireproof and little affected by moisture, but is brittle and heavy. Fiber boards are tough and light, but they may



Suggestions for constructing door frames, extting stops, glaing spirators, and making a prop



The wellboard is applied first on the cuiling. and then is needed against the well study

buckle from absorption of moisture unless both sides are given a coat of paint before using, and they are not frepronf

Before starting to put on wallboard, lay out the walls and collings for the panels, centering them, if possible, on the room or on spaces between openings, or otherwise planning for a balanced effect. Rather than have uneven panel widths, it is preferable to put in one or two extra stude where necessary.

Apply the board to the ceiling first, propping it up with one or two T-props made as detailed, and tacking the edges in a few places with flat-head nails. Strike white chalk lines to mark the centers of intermediate joists, and if the board used has a plaster center, nail every 8 in. with shingle nails. Take cars not to leave hammer marks. Then nail the edge every 8 in. If fiber board is used, it is better to use patent clinching fasteners, which are nailed directly to the intermediate foists before the panel is put up. If you do use nails, drive 1-in No. 16 wire brads every 8 in. and set below the surface for puttying.

Apply the board to the walls by tacking the upper ands first, nailing the centers and then the edges. Leave the adges about 3/15 in apart, unless the cracks are to be filled and the room is to be papered. In that case brads should be used on the edges instead of flat-head nails.

The first work in putting up interior teim is to fit the windows into the openings, so that the room may be closed up and mousture kept out. Cut off the projecting ends of the stiles from the casements and joint down the edges enough to allow the sash to be alipped

(Continued on page 100)

Iry this Yardstick

MEASURE YOUR KNOWLEDGE with the

POPULAR SCIENCE QUESTIONNAIRE

- Why does radium continue to give out heat for thousands of
- 2. Are the store solid like the
- 3. How was the cuth formed? ..
- 4. Why is glass transparent?..
- 5. How do we know that the mrsh is slowly shrinking!
- What is an electric curvent!... 7. How was persolated formed).
- Do electrons realty move through wire when an electric current is flowing through at i...
- 9. What physical changes in your body see produced by fear?
- 10. How do muscles sunt power?
- \$L What are X-rays.)
- 27. Can we see atoms with a microscape (...
- 11. Why does hest expand things and cold contract them?
- 14. Why does the moon appear to change its shape from time to
- 15. What is the brain made of I....
- 36. Why to it possible that the in-side of the earth is growing hotter instead of coldes!
- 87. Why is frost more likely on a cloudy
- 14. Does thinking use up the thinker's energy?
- 19. Which travels feature, electricity or light! ...
- 20. What simple tess will distin-
- mith woul from course? 21. What makes the noise of thun-
- 21. Why would men ultimately puffocute if all the green plants were killed!
- 23. Does the boiling of water ra-move the impurities in it?
- 24. How do the living cells of the body getthe energy with which to do their work?
- 25. How is the speed of light mea-

TOTAL PERCENTAGE

UR Brain

EVERYBODY is talking about the famous "Popular Science Questionnaire." Doctors, Lawyers, Professors, College Graduates and thousands of others have tested themselves with this Questionnaire. In the panel is the list of questions of which the Questionnaire is composed. How many of them can you answer?

Like an Old-fashioned Examination

May we ask you to make this test carefully, reading the questions slowly and giving thought to each one? When you cannot answerone satisfactorily to yourself, put a zero (0) beside it.

On the other hand, give yourself credit of four (4) for each satisfactory answer. Then when you are through, see how near you have come to making a mark of 100.

This is like an old-fashioned examination, but you will find it far-cinating. The questions all have to do with the wonders of the world we live in. All can be given quick and straight forward answers by any person of education.

All of the questions in the famous "Popular Science Questionnaire" and many hundreds of others, have now been answered, for the first time, in one book-THE POCKET GUIDE TO SCIENCE.

All that you probably ever will want to know about science is told in this one 284-page book that will fit in your pocket or grace a library table. Curiosity-satisfying facts about the world we live in aremade instantly available to you in simple

question-and-answer form in Тне Роскет Сипле то Science,

You are assured of the accuracy of the answers in THE Pocker Guide to Science because it has been edited by

Dr. E. E. Free, who has remarkable genius for condensing the known facts about scientific questions into easily remembered paragraphs.

SPECIAL OFFER

THE POCKET GUIDE TO SCIENCE IS not for sale, It is offered to you without one penny extra cost with a 14 months' subscription to Por-ULAR SCIENCE MONTHLY.

POPULAR SCIENCE MONTHLY "CRIrice on" from where THE POCKET GUIDE TO SCIENCE leaves off. THE Pocker Guide gives you all that the scientists have discovered up to right now—Popular Science MONTHLY will give you all the important, interesting and new discoveries of science for the next 14 months.

It takes over 300 articles and pictures every month to tell the readers of POPULAR SCIENCE MONTHLY all that has happened in the scientific, radio, mechanical and automotive fields.

Your Name in Gold

THE POCKET GUIDE TO SCHOOL IS BOUND in beautiful flexible fabrikold. We will stamp your name in 22-caret gold on the cover of THE POCKET GUIDE at no extra cost to you if you me the coupan below immediately.

We extend to you the Special Offer of a 14 months' subscription to POPULAR Science Monthey frequent price by the month would be \$3 50) with the THE POCker Gume to Scance—ell for \$2.95, plus the postage. If you are already a subscriber to POPULAR SCIENCE We will extend your subscription 14 months if you accept this offer.

P. S. 1-16

late this one brilliantbook of 284 pages has been condensed the outstanding. fasti abgot the world.

SEND NO MONEY

Send no money, just the conpon. If within 10 days after you receive the book and magazine you decide that you are not sutisfied in every particular, you tnay return them, and your entire payment will be refunded promptly and without question. Could any offer be fairer?

POPULAR SCIENCE MONTHLY 250 FOURTH AVENUE NEW YORK POPULAR SCIENCE MONTHLY I accept your offer of THE POCKET OFFICE TO SCHOOL and a .4 250 Fourth Avenue, New York months subscript on to Portland Script Montage 1 will pay be protected \$, 95 plus the portland by the delivers the Portland Control of the book and postplants, 35 paus the postage when he delivered the cold and and the first base of Postage Science Monthial. If the book and and for any more or research occupied meeting. It the reson and magazine are not fully activisety to me I will return them within 10 data and you are to promptly refund my full payment. Please stated in some to dold. Address If you prefer send \$2.95 with your neder

This seal on a radio or tool advertisement signifies the approval of the INSTITUTE OF STANDARDS. See page 4.



THE Beldensmel Asrial is not a trick aerial. It is a scientific achievement, endorsed by leading radio engineers.

Beldenamel Asvials are made of stranded copper. Each strand is costed with baked Beldenamel to protect the copper surface from corrosion. A Beldenamel Aerial cannot deteriorate. The signal strength and volume are constant, winter after winter, in spite of smoke and fumes in the atmosphere. No bare copper serial can accomplish this result. For distance and volume, install a Beldenamel Aerial, today!

Sold by all Leading Radio Dealers and Jobbers



Send for Free Illustrated Booklet

Belden Manufacturing Company 2304 H So. Western Ave., Chicago

Please send me your latest illustrated booklet, free, describing Belden Hadto Products and their see in radio work.

Nome

Address



AGENTS

Stamping names on Porket Key Protectors sample Check with you name and gel less, In. Stamping Outlies, Funblem Checks. Fuls. Name Plates.

HART MFG. CO. MS Degree St., Breaklyn, N. Y.



The Richard VV. The Hope

Wallboard and Trim for Attic

Continues from Bull 197

into the opening against the stops or bindstop. It is secured for the time being with finishing nails tacked into the jambs.

The door frames are built of 1 by 6 in. stock jointed straight to the width of the studding, plus the thickness of the wallboard on each side, plus 1/16 in. for irregularities. Bevel the edges back from the faces slightly to insure a close joint

between casing and jam.

Since there is little clearance between the head jum and head trimmer in the entrance to the typical attic room described in this series, the side jambs are dadoed into the head rather than the head into the sides. For a door 2 ft. 6 in. by 6 ft. 6 in., make the frame 2 ft. 6 in. by 6 ft. 614 in., Inside.

To set the frame, block one side trimmer plumb and tack up one side of the frame to that trimmer, plumbing it carefully edgewise with straightedge and level. Cut a board to the width of the frame and lay it on the floor between the bottom ands of the side jambs to keep them parallel with each other and the right distance apart. With shingle points driven behind from both edges, wedge the other jamb straight and plumb, and unil nolidly.

DO NOT neglect to level the head namb carefully, cutting off the bottomof the long side if necessary. Nail up the other jamb, test for straightness, and correct progularities with wedges driven from both edges. Then tack the stops in place.

The best type of stop for an attic room is the 3/8 by 11/4 in. round-edge door stor, as detailed. Some carpenters miter the joints between bend and sade stops, and some cope the sides against the head; but the best method is a combination of the two. Cut the head square on both ends to the exact length, miter the rounded edge to the depth of the mold, and split out the triangle so formed. Miter the mating end of the side stop and, following the corner of the obtuse angle, cut it square off from the back as far as the molding, as shown in the detail. Cut the stop 1/16 in, long and spring into place. The pressure will close the joint.

Since the thickness of the ordinary inside door is 1 3/8 in., the stops are placed 1 7 16 in from the edge of the jambs, allowing elearance for paint; but the stops should not be united tight until after the door is hung and the lock fitted.

Next, cut to rough lengths all the finishing trim. Look it over for pitch pockets and rough places, and smooth up thoroughly. For work that is to be painted, small pitch pockets are allowable, though these must be cleaned out with a chisel and patched with a aplinter of wood or a mixture of glue and sawdust

If, in sandpapering, a splinter of wood is raised from the face or corner of the piece worked upon, lift it carefully, place gine under it, and clamp down by means of a small block tacked with brads, with a piece of paper undernesth to prevent the glue from sticking it down.

"A Thousand Feet of Aerial Inside Your Home!"

says a Baltimore fan



"Longer Range-More Volume Closer Tuning—Less Static!

The new large Efferees gives the equivalent of 1500 feet of artial. Increased range, and volume, manufactures static and makes closer tub. 62

Fixed Condensers Improve Reception!

Principle is principledity designed to give lend out distable properties at the best in a few terms to be the same to be the set of the best of th

Write for Reports from Useral

Taxon the range and more volume on wher I shift is t an my the sympler have applied Wit his distance reports of outbookstir were

Type IXL (lorge) | \$4.00 Type BXL (small) 2.50

At any radio dealers son write iftend.



FISHWICK RADIO CO. 133 CENTRAL PARKWAY. CINCINNATI. O

I bear you. I can hear now With THE MORCHY
J PHONE. I've a pair

ney care now, but they are invoice. I would not know load them a tayed only last I hear all right." The Marky Place for the DEAF

to so the cure what glames are to the eyes. In challe a . confurable tedget

tion and herestont, firewise was adjust it. Over me handest in also said. We've for benefits and testimonish. Took implicate Oil., Som. 787, 20 L. 20th Herent, Philodox

"Experiments With 110-Volt Alternating Current"

ERE at last u a book that gives a practical working knowledge of the alternating current. The only way to gain a thorough understanding of electricity is by direct personal experiment. How a practical knowledge of the alternating current can be gained in an interesting and mexpensive way in shown. The knowledge that comes from experiment is of visitly more value than that acquired from the performance of the storootyped series of battery expersinents usually described in books on Alternating

The book "Experiments with 110-Yolt Alternating Current" is needed by every man experimenting with alternating current.

256 pages, 135 illustrations. Price, postpaid, \$1.75

POPULAR SCIENCE MONTHLY

See page 6.

250 Fourth Avenue New York City



ORNAMENTAL papers, especially if they are a little out of the ordinary and cannot be duplicated in the arts and eraits shops, are in demand for all sorts. of decorative purposes. They can be used for covering and decorating boxes and calendars, for lining books and for making attractive novelties.

A paper that has a frosted design can be made by using a saturated solution of Epsom salts (magnesium sulphate) in water. The solution is saturated when no more of the sait will dissolve in the water

The liquid is brushed on a good grade of paper, Bristol board or cards, placed in





Ordinary paper of cardboard can be given an ornamental froated surface simcly by coating it with a antigrated solution of Epson salts. The crystallised surface will less indefinitely if protected with a thin algoholic varnish

a horizontal position to dry. If thin papers are used, it is well to tack them to a drawing board so that they will not roll.

When the paper is dry, a frosted and crystallized deposit will be found on the surface. If it is wished to color these crystals, add a trace of dye or colored ink to the sait solution before applying it.

While this unusual design will last for some time, even if untreated, it can be made permanent with an alcoholic varnish of gum sandaras and denatured alcohol, to which a mount of ezonised turpentine has been added. Writing or lettering can be done on the crystallized surface without destroying the decorative effect. For that reason the crystals make an interesting background for holiday cards.

SPECIALLY prepared paper may be used in forecasting the weather. Disused in forecasting the weather. Dissolve 1/4 gram of cobalt chloride (not the nitrate) in 50 cc. of water and add 5 grares of gelatine. Heat slowly to dissolve and use the mixture to cost a sheet of blottingpaper. Normally the color of this paper will be pink, but it changes to blue in very dry weather and to a violet tone in most weather.—Ernest Bade, Ph.D.



NO PANEL **BUILT-IN** LOUDSPEAKER

Tor the Well Appointed Home

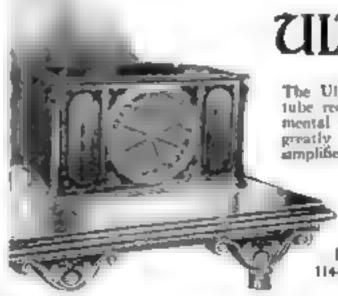


In protect the public Mr Lacaulta personal monat a botto of all genuine Receivers. Guarantreet a rong as their smale tremain unbroken,

NOBTRUSIVENESS with sufficiencythe rule of good taste—is the distinguishing grace of the ULTRADYNE Model L-3 Radio Receiver. It ushers in a new era of radio reception—a new, easier command of the air's treasures.

An artistic form of radio receiver that blends happily with every scheme of interior decoration. Pleases the eye with its charming lines, its beautiful two-tone mahogany cabinet, its fine proportions. Has the appearance of a decorative tablepiece. Utter simplicity with superb receptive and reproductive qualities. Your local radio dealer will gladly give you a demonstration of this new modern receiver.

Write for illustrated folder giping full details.



The Ultradyne Model L-3 is a sixtube receiver employing the fundamental principles of the best circuits greatly refined and marvelously amplified.

of Backy Magazaine 3149

PHENIX RADIO CORPORATION 114-A R. 25th Street NEW YORK, N. Y.

Diesel Engines Marine and Stationary By ENSIGN DAVID L. JONES, U.S. Navy

The most complete, thoroughly practical and up-to-date treatise on the Diesel Engine ever published It explains their construction troubles, remedies, operation and adjustments, practical trials and tests and the elementary thermodynamics of all types of the Diesel Engine. The book is fully illustrated with drawings of working parts and detail engineings. 400 pages.

Price \$5.00

Popular Science Monthly 250 Fourth Avenue New York, N. Y. I



The Milling Pencil Co.

34 Augele Stein, IR. Lorin, Do.



Always ready for immediate use..

COMFORT ABLE old ciotaes a sweet, cool pipe, good took and a quiet room where you can make useful household articles, or just putter around, spells as crosspor contentment and pleasure or thousands of men. And of course, goe is one of the town you use most often.

Perhaps you have never thought of the special advantages of many Le-Page's Liquid Glue. It is always ready for immed ate ose. No weightne, soaking or heating is required. Its quality in always the same. It "sets" slowly enough so that you have plenty of time to place the joints together exactly as they should go. Slow setting also a lows LePage's to penetrate the wood, increasing the strength of the joint LePage's Liquid Give in equal in etrength to any animal glue. Buy a can for your workshop. It is the cusiest, quickent, handsest form of Give. Insist on LePage s.

RUSSIA CEMENT COMPANY Loboratory and Factory

209 Ecses Ave.,

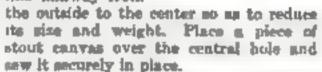
Glowcester, Mass.

Bottles, Tubes, Cans

Bow Used for Shooting Toy Parachutes into the Air

SHOOTING aris a sport to thrill young bowmen who are looking for something novel in the way of archery.

Remove the cover from an old umbrella, being careful not to rip the cloth. Cut the cover around on a has halfway from

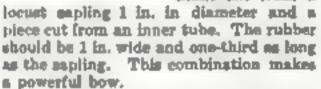


For the arrow you will need a straight stick a little longer than the usual target arrow. It should be about 1 in. in diameter, tough and well peasoned. Wrap one end for about an inch with fine stout wire. Drive the points of the wire into the wood so that they cannot cut

your hand

Fasten the center of the parachute to the stick with a small screw or a large carpet tack. Tie lengths of a strong fishing line to the corners of the cover and attach the cords to the arrow at about the halfway point. A small notch will keep the string from slipping

If no strong bow is at hand, you can make one from a



After being shot vertically into the air, the parachute opens and the arrow descends slowly and gracefully to the ground. -H E. WENRICH

Paste for Imitating Carving

LD picture frames, glove or work boxes and similar pieces may be decorated easily with imitation carving.

Rice is boiled in water to make a thick paste and mixed with starch to a doughlike mann, which is rolled into sheets, cut into squares, and allowed to dry.

A mold then is made. One simple method is to heat gutta-percha in warm water until sufficiently soft to be pressed over the carving that is to be duplicated.

Place the previously prepared squares between damp cloths until they are moist enough to be kneaded into a doughy muse and press the material into the mold.

The finished work, which looks very much like ivory, is glued in place.-W. J. E.



MAKE MODELS Start a Home Workshop

"Model Making" by R. F. Nates de-er bes the const notion of model gases against steam-engages, but shed via, busts, dynamos. turbines ta lecato, u be eleters are devoted to made a of various nature.
It will be proper to become a better mechank. It will help a be of har moder but,
and madering, lattle work, tempering, drilling,

fullette-making etc.

The stabosk every anateur or professional tast same and more it to acceptation of have had been also addressed the matter of the state of the state

POPULAR SCIENCE MONTHLY 200 FOURTH AVENUE, NEW YORK



perachetts and bow



Recipes, Formulas and Processes

This book of 800 pages is the most complete Back of Recipes over published, giving thousands of responsion the manufacture of valuable articles for every-day use. Hotel, He is Transcal I was an Secret Processes covering every branch of the useful arts are

10,000 Practical Formulas—The Best Way to Make Everything

A bush he which you may turn with confidence that you will had one a many food and for A mine of aforearies, up-walls a far every propert. Contains an increase member of formulas that every the stages to have, that are not found to may other work.

Price \$4.00

Popular Science Monthly 268 Fearth Avenue, New York



We Make a Winged Toboggan

(Continued from page 72)

it would take a rather high rate of insurance.

Harley and I dragged it up the mountain the next afternoon to our preferred starting point, which was about 500 ft, above the camp. He had bargained to try it first. But I liked Harley Tryon, and insamuch as the idea and workmanship had all been my own, my conscience became apprehensive. I was alraid to try it first; so was he, though neither of us would admit it to the other then, although we did later.

We flipped a coin, and it was still his turn first. But suppose the thing actually did fly and had a crash! I bated to think of all that work being lost in a first flight grash, and I wouldn't get a chance to ride it. So we compromised and decided to ride it together the first time down. We should have preferred also to compromise on the distance of the first tryout, but could not, because the mountain was so steep that we had to go up to this certain point in order to get a footing to climb aboard.

Harley always had ridden behind to do the steering. We took the same position; although now I was in the "cockpit," and couldn't roll clear of the thing if it became necessary or desirable.

WE CLIMBED on. That bill never had looked so high and steep, nor the freeen crust so hard and smooth

"Are you ready?" Harley called. I answered, and we started

The pick-up was immediate and terrific. with the sensation in the stomach of going down in an elevator. Faster, faster! The tears were streaking across my temples from the key wind. I couldn't breaths, or at least didn't, in the excitement. Only one thought remainedhang on!

Two-thirds down we struck a small drift, and for a hundred feet beyond. though it was less than half a second in time, there was no sound of the toboggoplane's scraping the frozen snow. At the speed we were going the actual lift was small, but the fact that it actually had lifted us for a 100-ft, jump was demonstrated by our tracks.

At the bottom of the bill was a lake, 1000 ft. across, frozen and covered by 20 ft. of snow or more. We consted across this fiat to the far side, started up the opposite bill, and soon stopped.

The next time Tryon went alone. He sat well forward in the cockpit, and halfway down the hill there were unmutakable signs that the Dragonfis was going to leave the ground. When Harley reached where the bottom should have been, he was 10 ft, off the ground going like a shot. He landed straight and even, and finally came to a stop.

After that we alternated rides, with more or less good natured rivalry for height, distance, and near-accident risks. The sport never became dult. It was never even reasonably safe on such steep hills. It never falled to offer a

(Continued on page 1847)

Pure Quality

"Man !- of all the houstiful, round and fall tones, this is the cut's pujature! Well, folks, I'm. Deven matil destis do us Joint !"

A Newspaper Radio Editor.

For Neutrodyne Scin

"Your resistance roughed amphilips as certainly all that you classe for it. I would not best take a moment to recommend it to anyone who wents real quality without distortion. 1 did not find it necessary to me high voltage to get all the volume I wouted eather, on a ats unbo Reute-dyne."

A Neutrodyne Fan-

For a Super-Hetarodyna

"I am using these steps of Daves amplification with wesderful cesults. The outstanding characteristic to large volume. This feature is very decirable when used on a Super-Hoterodyne as I am using it." A Professional Operator.

Two Converts

"I followed your odvice and put in another complex instead of a transfermer I'm more than pleased. No your trhatformers for me! Your method of amplification to butter, chapper, and court to contact to then any other."

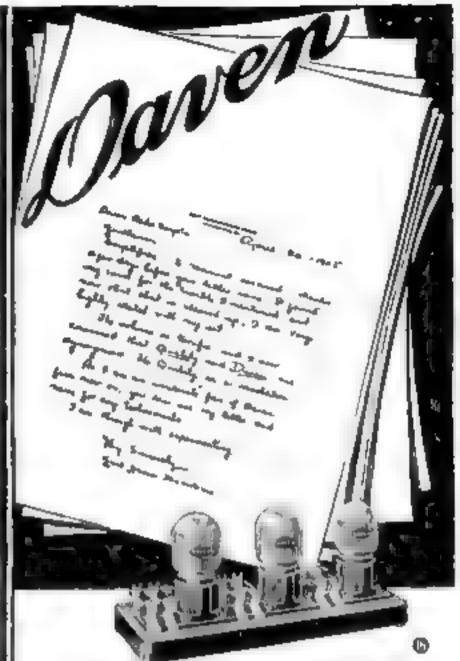
From the Mid-West.

"Yesterday I got snother Daven Unit and hooked it up. It would take some PULL to pry it every from me. Here & reguler set non I fell to see how arrows can stirk in transformers ofter bearing must come through your bay

A Satisfied You Yarhar.

Quality Surveyels Distance "After spending much meary on arts arong to get OX, I gave up in dispust and conventrated my efforts to produce quality reception with freedone from distortion and at has lee got it bring your Resistance Coupled wests.

From the Puzzle Copp. RAMES PERSONALD OPEN



TOU VEHI AND DAVEN ARE SYNONYMOUS"

"The Quality is a receletors." "Man" of all the beautiful, round and full tenes, thus to the cat's paperase." The values is precise." Unincreasely to use logic volume to get all the values I want." These are setted phrases Daves quality rules fine have written as

Ask to see the Daven Super-Amplifier. It is for set owners who want more values without distortion, and set builders who want Resistance Compled Amplifica-

tion without the labor of assembly hor prester ampishi atom in revistance templedumps force, use the new Davin Take Mt 20. Type Mt. 6 in for lost or suspent stage of any set. Development are said only by good devices

THE Range Above PAYEN RADIO CORPORATION

Married Secretary

DEVEN MARINI THE WATER WATER British Bernel

Per Beatiers

LITTLE THE-BIG THINGS RADIO

AND MICHIGAN, PROPERTY.

SEE-

the big Prize Offer on page 4 of this issue

and Makes \$

). M James recently installed an amazing menderics on his car which actually dowbled his culcage por

him the astronomy profits of SID in just one day! This wonderful new invention makes practically any car give twice its regular mileago many go 37 to 57 and 60 to the on 4 gailon.

Earn \$250-\$500 a Month

Many earn ble money just telling your friends about this startling new device. Verson Gaines made \$94 in one day. J. W. Cronk \$57 in one but? The demand is coormous. 'O million car they see it. Others make \$250-4500 a month in or spare time. And now the javentor will giasily send you a sample at his rain tok? Write 5 to J. A. Stranski, A. 730 Stransky Huilding. Pukwana South Dakota.



How to Make More Money

Sell radio, spare time evenings. A demonstration means sure sale. Whip any competition—longest distance possible—lowest prices—big communions. No selling or radio experience necessary, 12 sales lessons and 10 radio service lessons FREE. Local ada, attractive booklets and letterbeads with your own name. Exclusive territory to proven men. Start right now to build a permanent business of your own,

100 Weekly in Spare Time

Many representatives making from \$50 to \$100 weeks by working evenings -you can do the same. Our 56 page Ozarka pian will prove to FREE copy for those who sak for Book No. 100. Better write today—territory going fact—only plan of its kind—a proven success for four years. Don't fail to give name of FOUR COUNTY

OZARKA, Inc. 130 Austin Avenue Chicago, lithous

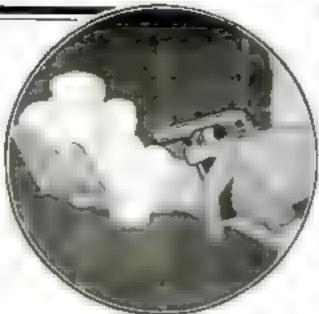
Better lather, easier shaving from the Latherizer Or your money back

CLEAN, accurate lather-making machine, now displaces the inaccurate, musey shaving brush. Try the nickel plated Latheriaer 10 days. If you return it, the full purchase price is refunded at once. The 10 days' use and soup have

cost you nothing.

Operated by the squeeze of the bulb, the Latherizer, in a metal chamber, mixes the right amount of air, water and soap for the perfect lather, passes it through a metal screen, presents it to you through a spout ready-to-shave with. This is truly scrated, water-impregnated lather so fine in texture it needs no rubbing-in. It

Send guaranteed money-back coupon



speeds shaving.

The Latheriser saves you money because it seves on soop and outlasts many brushes. It saves time in both shaving preparation and shaving itself. And it saves the foce.

Noted barber shops use the Latheriser. So do thousands of men, travelers especially. All welcome it as one of the biggest shaving improvements.

Retailers: -

Soon the Letheriser and soop rehits will be sold through retail then-nels noily. Sears will be backed by bay national advertising campaign. Write national advertising campaign. Write now for terms and facts which will reveal to you must of the biggest propout one in the history chandieneg.

THE LATHERIZER CORP. Dept. B1, 452 Pifth Avenue

> Retall Promotton Dept. New York City

THE LATHERIZER CORP. Dept. B1, 453 Fifth Avenue, New York.

Oostlemen Under your guarantee to refund the full purchase price of I return the Latherner complete. full purchase price if I seturn the Lathermer energiete after 10 days of use you may send me the Lathermer (3 slugs of soap included. I encuse \$5 check currency P. O. Money Order). If I return the Lathermer (wil) not be charged for any of the soap (I cake used in the trial and will receive back at ones the ful. \$5.

Name

Address

City

State



THE MOST POPULAR MACHINE PARKS EVER BUILT! A w noer from the start. A real machine, yet convenient size for the small shop. Poet everything itt woodworking. Has circular rip and cut-off saw, 6inch jointer, 16-inch bandsaw Lathe and shaper attached if desired at small cost. Operates from any right socket. Just plug in and go to work.

Write for interesting specular

The Parks Ball Bearing Machine Co. 1547 Knewleyn St., Cincinnati, Obio Coupling Feetregs 200 Notes Dame East, Mantecol, County



An Easily Made Smoking Cabinet

EVERY man who works with toolswhether he is a novice of a handyman with sing experience—will find it casy to bund this hand-one smoking calmnet

Strace for clears, controllers, match botten, copar and organitude for a and price cleaners are provided. A feature that every any key and his tries will an irrunte or the ash trate which are true vable; at both ends of the cab not. When not in one these ash receptacles Can be caused

Blueprint including full details for making the ham some emobile grabines can be occured by sending 25c to-

Popular Science Monthly





We Make a Winged Toboggan

(Continued from page 103)

new kick in each descent, or flight, as you please.

Fifteen feet off the ground was perhaps the maximum attained, but considering the speed and the construction of the machine, that was plenty,

Between 25 and 30 trips were marked up before the crash. Confidence and the aimost inevitable contempt of danger through familiarity, brought the sport to a mudden finish.

It was early in April, 1925, three months before any signs of spring appear at that altitude, when the Dragonfly made its last flight. A light, gusty wind was blowing. Harley went down the first trip, and after coming back up the hill warned me to look out for the breeze.

I sat me far forward as I could upon starting, and the irregular air pressure on the way down made me healtate, but it was too late. When nearly to the bottom I slid back, but I had waited too long and alld back too far. The front of the machine raised to a horizontal position, and then kept right on going up.

I had some recollections of bending my head back and seeing the snow above me, about 20 feet away, and then we started for each other, the snow and I. The next I remember, some one was pulling on one of my logs, which were the only part of the I could move. Everything was crammed with snow-eyes, ears, nose, mouth, collar, and I couldn't get my breath. ilarley told me later that the toboggoplane had just kept right on rising, and when well upside down I had left it and plunged bead first through the crust into

Something like that must have happened for my face was like a piece of raw beefsteak for two weeks. I was thankful that the grust had broken at all, as it was hard enough to support the heaviest man without giving way.

The Dragonfly came down sideways and crumpled a wing. The next few days we stayed inside, and a snowslide came crashing down our favorite speedway, which closed toboggoplaning for the season—perhaps forever

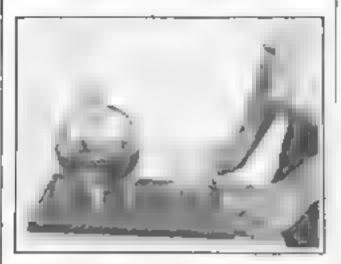
While there is no question about the danger of making one of the toboggoplanes for use on mountains such as Mr. Keating describes, the addition of wings to a toboggan will add immennely to the sport of counting on ordinary hills. The toboggan skims along the snow much as a hydroplane rides on the water, and at moderate speeds there is no danger of its rising far in the air.

Glycerine and Alcohol Prevent Frost Forming on Glass

THE formation of frost on windows I can be reduced materially by rubbing the inside of the glass with a solution of glycerine and alcohol. The solution is made by dissolving a teaspoon of the glycerine in half a pint of alcohol. Apply the mixture to the glass with a clean rag.

We Home Workshop

Common Corks Used in Making Stands for Glassware



IN ANY home workshop, kitchen, or laboratory where flasks, jars, and percelain-ware are filled with hot liquids, the danger of breakage may be lessened greatly by the use of a stand made by fastening corks with glue and nails to a wonden baseboard .-- J. H SCHALEK

Sharpening Your Skates

Laurenment from buge #2

Hollow filing is a little more difficult but it can be accomplished with the tool illustrated in Fig. 4. A round file of large enough diameter to cut a very shallow depression in the langth of the runner is emential. Cut two hardwood blocks about 14 in. thick, 1 4 in. wide, and 4 in long. Make notches near one edge to take the file and then fasten the blocks securely to a third piece, the top, so that the space at the bottom forms a slot that will alide closely over the thickness of the skate runner. The file can be held in the blocks by a setuctew or a bolt fitted down through the top. Fit the appliance over the skate and sharpen the

runner by pushing forward just as if you were planing a Manager 1

Where an emery wheel can be used, an excellent job of hollow grinding can be done with the jig shown in Fig. 8. This fixture is nothing more



Fig. 6. Two types of holders for files

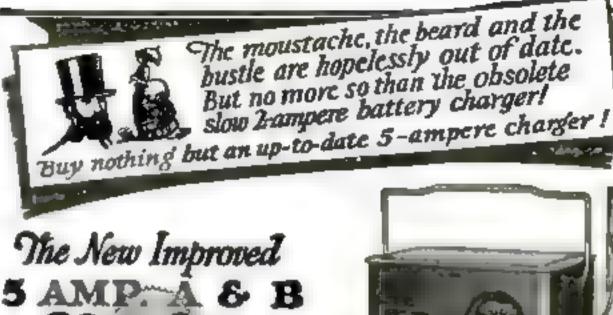
than a vertical place of board fastened rigidly to a baseboard. The top edge of the vertical piece then is cut out to fit enugly in the openings of the skete frame. A steel plate is drilled so that it may be fastened over the skate with screws. It should be arranged so that the runner will come balfway up the cutting face of a 4- or 5-in, emery wheel.

By pressing the runner lightly against the rapidly revolving wheel and moving the jig along from side to side, a professional job of hollow grinding will result.

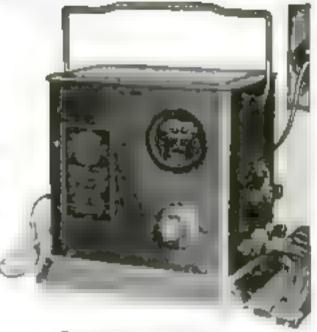
Figure 6 shows in detail the blocks used

in Figs. 3 and 4.

Use only the best quality files for skate sharpening. An 8- or 10-in, mull bastard file thunly is chosen for this work.



5 AMP A & B



Modern-Rasi

TOW you don't have to wait for days while your battery charges. The new 5-ampere GOLD SEAL HOM-GHARGER charges A or B batteries three times as fast as last year's slow chargers - - - it fully charges the average radio battery OVERNIGHT !

This year when you buy a battery charger, he sure it is a modern fast charger - - - one that charges at 5-amperes. To be absolutely sure, insist on the 5-smpere GOLD SEAL HOM-CHARGER.

Write for are edition of our interesting Free 16-page backlet "The Secret of Distance and Volume in Radio."

THE KODEL RADIO CORPORATION 500 EAST PEARL ST. CINCINNATI, OHIO

Owners of Kodel Broadcasting

\$100 in Cash Prizes

front of book



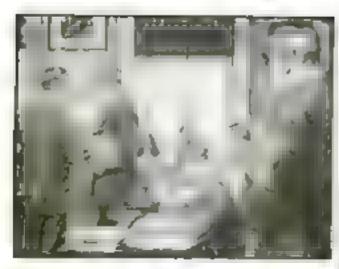
Write for Free Samples MARKSON SHIRT SPERS, 602 Brandwin, New York.

Big Value for 10Cts.



6 Sunga, works and made: 23 Pictures Pretry Caris 40 Ways to blake Money I Joke Book 1 Book on Love I Magic Book 1 Rank on Letter Weiting 1 Deepth Book and Fortune Teller 1 Cark Rook: 1 Base Eali Book Lenguage of Flowers I More Telegraph Alphabet, 12 Clemical Experiments Magic April 1 of Great North Pole Game 100 Committees for Autograph Albuma. All the above by mail for 18 chs. and 2 the postage. DOUBLE CO.

ROYAL SALES CO., Desk 116, Horwith, Ocea.



"Which Man Shall I Promote?"

WILL your employer think of you when the next good position is open? Will he say, "There's a man who is training himself to handle bigger work," or will be pass you by as just an ordinary routine worker?

Do not key to feel powerff. Your employer is waiching you more clusely than you may back like a constantly checking up on your work your abilities, your sapirations. Stored away in the back of his mind or filed away in black and white are his lin measure of the kind of man you are and the hand of man you are and the hand of bide you travel to be.

He's willing and ancious to pay you more money the minute you prove that you are worth more money. But he can't take chances. When he promotes & man, he wants to be sure he win make good.

Devide nove-today—that you are going to be rently when your chance comes. Choose the post on you want in the work you ake best then true for it hop rais do it is appared to a your own bosse. through the International Correspondence Schools.

Write today for an interesting descriptive booklet, which tells the full etery. It won't cost you a penny, but it may be the means of changing your entire life.

INTERNATIONAL CORRESPONDENCE SCHOOLS

lititent and largest oversependence schools in the world. Withink rist please will the first I can one for for the policies for all the employer percent of their marked an X BUT NESS TRAINING COURSES

Rupipeta M. Repetenti
furtor of Markey meth
furtor of Markey meth
furtor of Markey meth
furtor of Markey meth
furtor of Markey Continue
flusters of Markey Law
flusters of Markey Law
flusters of Markey Law
flusters of Markey Law
flusters of Markey
flusters
flusters of Markey
flusters
fluste

to said therefore | French

TERMINICAL AND INDUSTRIAL COURSES

Street less King hearing
Electric Lagitime
Mechanical Fractions
Mischanical Fractions
Machine Blog Processes
England
Machine Blog Processes
Chemiter England
Machine
Mischanical Machine
Mischanical Machine
Mischanical Machine
Machin Architect

As a secta Bluegrania

As a secta Bluegrania

As intercurs desiration

As intercurs desiration

As intercurs business

Chemistry Differency

Aspleations for neg

Agriculture and Positiy

Mathematics

6-24-25

City ...

Address

specupation of Canada, and this couple to the Intersectional Correspondence Schools Consider (Amited, Montreal

State.



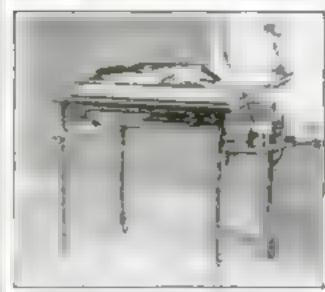
CORONA FOUR With standard office keyboard — an office typewriter an portable form. Weste for literature.

Corner, Typewriter Co. 112 Main St., Groton, N. Y



Drawing-Table for the Home

WERY home mechanic, no matter if he specializes in wood or metalworking, often has occasion to make a working drawing, sketch, or layout. For such work it is helpful to have a well equipped drafting-table. A good model is that illustrated, which is remarkably rigid, considering how light the construction is. When not needed for drafting, it



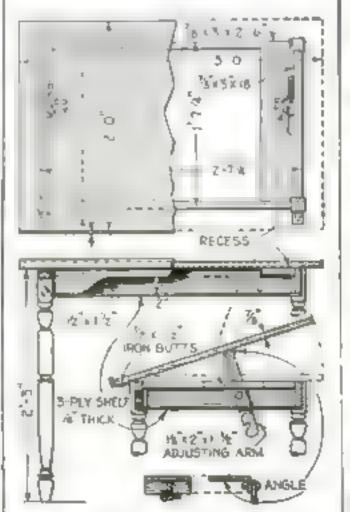
This adjustable table has storage space for all the materials used by a home draftsman

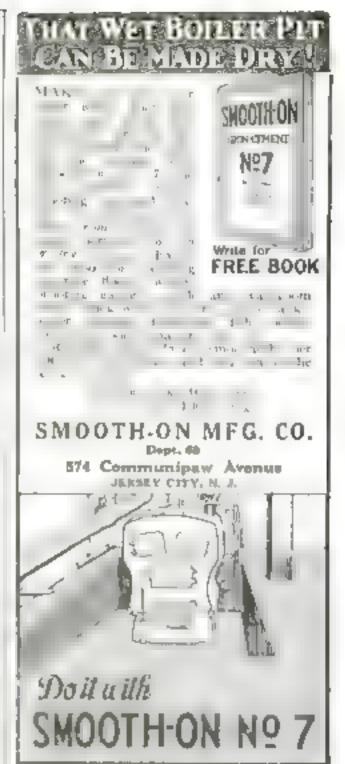
will serve other purposes, as the top can be dropped that

The table is constructed of any soft. clear wood obtainable or an unfinished kitchen table can be purchased for a few dellars and remodeled

The side and end tails are constructed from 1-in, stock dressed to 34 in, and are all 8 in. wide. Each and rail is 18 in. long and has a tenon cut at each end to fit a corresponding mortiss cut in the legs.

(Continued on some 197)









FREE Book on

Write (adap for 161 page FREE book presses to particular and testimental from bandings of grainful nears whose hearing has been pastered by ment our "little seirolers plants for the sure."

Wilson Common-Sense Ear Drums quire no madicine but effectively replace what is facting or defective in the natural ear drums. They are simple devices, which the water wally lits lyte the case white they are byiefble. Bolt, outs and comfortable. WILSON FAR DRUM CO. Incorporated

Top and front views of the table and end

section showing the adjusting method

The House Werkshop

Fitting a Violin Bridge

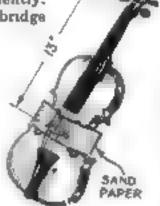
ALTHOUGH a violinist usually goes to a violin-maker to have a new bridge fitted to his instrument, the work can be done by almost any one.

Place a piece of No. 000 anndpaper, as shown, with the abrasive side up, and

move the bridge from aide to side until the legs are sanded down sufficiently.

The curve of the bridge less will conform to the curve of violin and will bear perfectly.

The distance marked 13 in. on the drawing, which shows full-size violin, should be 10 1/2. in. for a threequarter-size instrument, and 10 1/2 in.



Location of bridge

for a half-size model. - GEORGE A MORL.

Drawing-Table for the Home

(Continued from page 100)

Dowels may be used in place of the mortime-and-tenon joints, if preferred.

Both aids ratis are 30 in, long and are joined to the legs the same way as the end rule. The front rall has a portion cut out as shown to provide access to a sheet of 8-ply veneer, which is fastened to the lower edges of the rails to serve as a shelf

The legs are turned on a lathe or made straight, as desired. The rails and legs are assembled with a good grade of flake or liquid glue and after they are thoroughly dry, a strip 1/4 by 4 by 17 1/4 in. is fastened in place at each end, flush with the rail tops. These pieces have mortises to provide clearance for the adjusting arms and the nuts that hold the arms to the angle from fastened under the top.

A round-headed wood screw having a shank about 14 in. in diameter and projecting 36 in., is located in each end rail about midway between the edges and 10% in, from the outer edges of the front rail; it is to engage the notches on the adjusting arm.

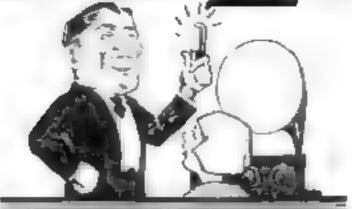
The top is built up of 32-in, boards and in 24 by 36 in. A strip 1/2 by 1 by 36 in. with its ends beycled, is secured to the front edge of the top to prevent the drawing-board from sliding off when the top of the table is inclined.

Two small iron angles made from 14-in - thick stock are recessed into the top on the under side where shown and fixed with screws. Two 11/4 by 11/4 in. from butt hinges also are located on the under side of the top. The two iron adjusting arms are made from \$\ind-in-thick stock and are secured to the angles located. in the top by mesns of small, roundheaded stove boits.

The table shown in the photograph has a small auxiliary shelf 54 by 6 by 24 m on each end, supported on 4-in. pressedsteel shelf brackets and provided with a stop on the inside edge between the legs.

When completely assembled, the table is cleaned up with fine sandpaper and finished as desired.-W. J. E.

now we'll have clear music



TOT just a sense of jumbled topes but clear music - that's what you have a right to expect from your radio eet. And there is no surer way to achieve this expectation than switching to Magnatrons.

Magnatrons are the product of the oldest exclusive makers of vacuum tubes. Every known improvement naturally has been used: along every inch of the way experience has been the guide.

There's a Magnatron for every purpose. The DC-201A, the DC-199 (large or small base), the DC-120 (for super volume), and the Rex (for B eliminators) all list for only \$2.50 each



00 in Cash Prizes

See Page 4 in front of book for details

Railway Postal Clerks \$1900 to \$2700 a Year

(All Postal Pay Just Raised)

Steady work. No layoffs. Paid vacations. Common education sufficient.

Travel See Your Country Mail Coupon today-8URE



FRANKLIN INSTITUTE, Dat. E-276, HOCHESTER, N.Y. of the United States of the Without charge (I) Specimen, Redway Postal Circle Resolvation of postdom. (2) List of other U.S. Concrement Johnson open to men and women. (I) mg. (I) Send lest straple concluing.

Z Address

Name





EARLE E. LIEDERMAN The Muscle Builder

Anthor of Africale Business. Secrete of Bereiting, Secrete of Strongth, More a House, one,

There's a devil inside of year. He's series to the year. Lank out for him: He tell year and to write out hard. What a size of a size the form on points on one of the point He other year hard to be selected in the size of the life year and a size of the life year and a size of the lank of the year of the well that year of the well that year of the well that year

SAVED!

Thank which he by their your bases another man make of you. He is by transported parties I will not be a few to be a distribution in the control of their section of the control of their section of the control of the

Which Man Will It Be?

per up in visu set your even future. You traff to be the Hemon is name? That will, let a get hear That a where I remed in. That a my set here's what I'll do dot yiels.

In not let don't I'll increase yest dom one full included a real see annually massive. You and I'll set in the whole real yield the best in the wave one. Party a continuity up your slendform. I little was a new to the traffic up your slendform. I little was a new to the first the pillite. I'll literally set in the wave of the military you but it. Alcohol to be and a not a no up of the most party of the pillite. I'll literally set in the little who is these arrest principles a not traff or your set here and the could be principled a not traff of the sense and the could be principled a not would be a new and the property of the world. I may make he are a supplementations of the sense and the province of the world. I may make he are and the could be provided at the could be a new and the provided at the could be up the following these things.

Send for my new look

"MUSCULAR DEVELOPMENT" 64 Pages and It's FREE

What do you think of bat? I don't tak out our And it is the perphets releve of reaching you extra believed to replace the last out of reaching you extra believed to the last outer. But here a new four dozen full same phonons of myself and want of my price winning purels. This is the topest callery of strong more ever assembled. And every last one of been showning my praises. Look them of our lifty to a set the total of his book you had deter roll over you exided. Come on them. Take out the oil pen in year if and age your name and or result on the column. If you have the stage of the popular appears will be also be to the total to. It you have a same and or results to the column. etamp, a perior will do Bu, sp. is think to be at your Tallerrow you may beget Rentember it a generalized for pathing and no strings attached no obligation.

GRAB UT

EARLE E. LIEDERMAN

384 Broadway Dept. 1391 New York City

EARL & LIEDERMAN

| Dept. 1301, 306 Breadway, New York City Dear Str.—Pt are send as absolutely FREE and without any obligation on my part whatever a copy of your latest book. Muscular Development freeze write or print plantly.) |
|---|
| Name |
| Street |
| City State |

Operating a Model Railroad by Electrical Controls

to second transpace (U)

are controlled electrically by eight pushbuttons by the method described last month, it is possible to run two trains in opposite directions continually on either the outside or the inside track. The cross-overs, of course, act as sidings.

But you will need some control over the speed of the individual locomotives. In other words, you will have to be able to stop either train without interfering with the operation of the other one. Otherwas it would be impossible to run one train onto a siding and have it walt there while the other train goes by on the man line.

In Fig. 2 you will note, in addition to the track layout, that a switchboard is shown. This switchhoard differs from the one you will need to control the track switches only in that switches to control the current to the track must be so built that you can leave them in either the open or closed position. They can be of ordinary porcelain-base, knife type, or if you wish to do an especially next job, you can construct a panel with some of the push-pull or toggle switches sold as Blament switches for radio seta

WHEN all of the awatches are in the closed position, current is being supplied to all sections of the track

Assume, for instance, that you are operating two trains in opposite directions on the outside track. The buttons are presend to throw the switches so that the train to reach the siding first will be switched onto it, and a switch is thrown, cutting off the current from the track of the siding. The train goes on the siding and stops. A button is pressed to close the main-line switch and the other train goes by. Then switches are closed and buttons pressed to bring the freight out on the main-line track again and speed it on its way.

Even if you do not attempt the construction of any electrically controlled switches, it will prove well worth while to install the sectional control of the track as shown in Fig. 2. Such problems as running two trains in the same direction on the same track are simplified greatly if you are able to cut off the current from any section of the track without disturbing the rest of the system.

Suppose, for example, that you wish to run two trains so that one follows another. Put the faster train in front and when it gets too far ahead of the second train, stop it at a station while the other train picks up the lost ground. Or you can keep the faster train just behind the slower train by momentarily opening and closing the switches controlling the current to the track sections over which the faster train is passing.

There are almost endless possibilities for the development of electric control for model railways and, luckily enough, the main requirement is time, since bell wire, knife switches, and other pupplies. are quite cheap.

PRACTICAL BOOKS

THAT WILL

RAISE YOUR PAY

WRITTEN in easy-to-understand non-technical language these books will help you in your chosen trade, Every book is an entire course of instruction condensed into one volume. Thousands of men have used them to increase their pay. You will find them full of information and ideas that will help you raise your pay.

Painting and Decorating

| Rest Crafte Book of Hotte Furnishin | gand |
|-------------------------------------|---------|
| Der a ion Cloth | 83.90 |
| House Pa it by Methods with the | Bruidi |
| and heav Gun, my banders | out her |
| Chith | 82.00 |
| Interior Woll Decoration by V: | abile |
| Wil her the first the | 14 00 |
| The Mixing of Colors and Pane | m, hyp |
| A Superation Cards Corb | \$2.00 |
| A Show at his we Cards thorb | \$4 D0 |
| Sugh Pathil ng my Alambin. Ch. h. | \$4.00 |
| 26s tog a Blank of Designs | |
| Tyrian san left in | 84 00 |
| Madern Pasities a Cycloner a Cath | \$1 00 |
| A some of Painting Cloth | 81 50 |
| New Has wond but shing. Cloth | FI 50 |
| | |

Steam Engineering

| Swingle's Handbook | for Steam | Engineers |
|----------------------|--------------|------------------|
| part beat a me | | |
| Figure, the firm the | ette and A | service but |
| March and S | a si flatty | at Digital refus |
| Tieur in et e | | £2 00 |
| Steam, Boiless | Lenthere | tte \$2.00 |
| Swingle's Catechian | of Stram. | Gun and |
| Esecution Engineers | ng. Leathers | etto 31.50 |

Carpentry Books

| Cloth Hinding | |
|--------------------------------------|-----------|
| Modern Carpentry, 2 vols | 23.0b |
| The Steel Square 1 valo | 83.00 |
| Millery Day may or | \$1 10 |
| THE SP PARTY OF | 32 00 |
| I abler a Archivectural Drawing, and | Na 00 |
| Concress and | B1 50 |
| Practical Dubin we | 00.18 |
| Roof Francing by Van Gasbeek | 81.00 |
| | * * * * * |

Electrical Books

| Talandanes Installant Assessments that | a a la como |
|--|-------------|
| Telephony, Including Automatic Swi | center. |
| my samen, 450 pp. Leatheretti | 22,30 |
| Practical Aprilled Effectively | \$7.00 |
| W he Dagrams and Descript one | \$ L 50 |
| Armst. e and Mannet Wino bg | |
| Electric Motorn, D. & A. | 0.1,160 |

CHECK

—the books you want and mail today with your remittance.

We will send you the books you order on our guarantee that if you are not thoroughly satisfied with them we will retura your money

POPULAR SCIENCE MONTHLY 250 Fourth Avenue New York

POPULAR SCIENCE MONTHLY

Please send me the books I have checked for which I enclose my remu cance of \$\frac{1}{6}\$ I am not ordering these brooks in the bank that if I am not nationed my money will be refunded.

| PARTIE | | | 4 | |
|-----------|--|--|---|--|
| | | | | |
| Artiferen | | | | |

How to Lay New Floors

KERPING the floor of a home shipshape is a perpetual problem, 4s-

pecially if the wood in of a poor and aplintery quality, or if the floors have been abused or neglected. When the floors are in really bad shape, they must be relaid. Fortunately that is not a difficult job. It is one you can do yourself with a saw, hummer, and square, provided you are willing to take a little time and pains.

The popular material for wooden floors just now is oak, which makes a much finer looking surface than yellow or North Carolina pine, although it is more expensive, Maple also is used, My own preference is for oak, as I believe that the additional expense for material



can be disregarded when one is doing the work himself and consequently saving the cost of labor.

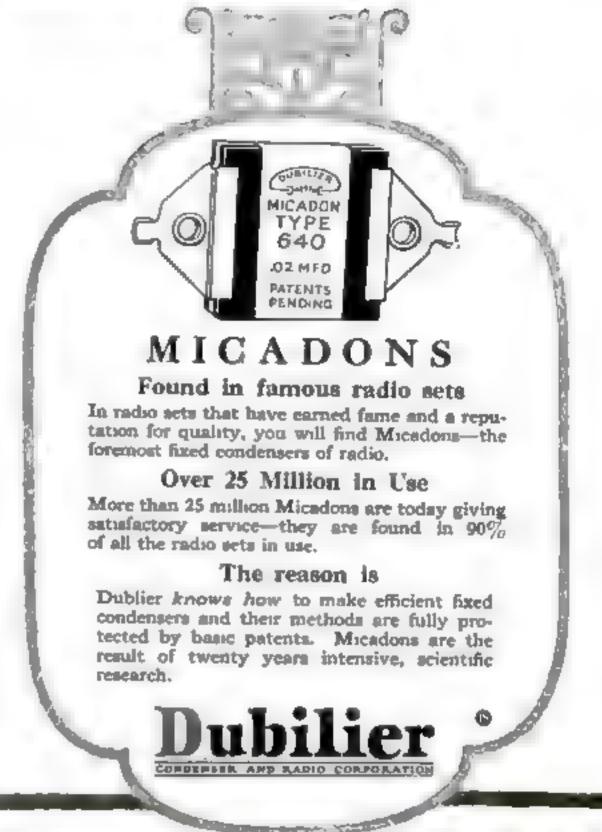
There are at least four thicknesses of flooring from which to choose. As your old floor probably is worn so unevenly as to have depressions here and there, it is better to use rather thick stock for the new floor to prevent the boards from springing. The 14- or 54-in, thickness is perhaps the most practical. In cotimating your flooring at the 14 or 16-in. thickness, allow 50 per cent more than the actual area if the boards are to be 11/4 in. wide, or 38 1/8 per cent extra if they are 214 in, wide. The narrower flooring is, of course, the better

Have the old floor dry. Do not mop it beforehand, but sweep it clean. Lay damp-proof paper over the old floor-not common building paper, but some kind that really will stop dampness from coming through

Lay the new boards at right angles to the old floor boards, after nailing down as solidly as possible any loose or springy places in the old finor

Start the first board by placing its groove to the wall after having removed the quarter-round or base-shoe molding Do not, however, push the first board tightly against the base. Leave a space of 1/4 in. to allow for any possible expan-

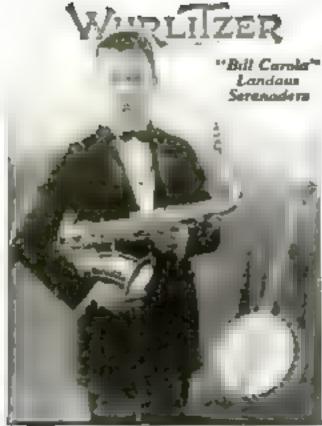
(Continued on page 110)







LOTHE OTD. & CO.'s hour of mirely.



Couldn't Play a Note-

"When I sent for your catalog, I didn't know a note of music. A few months after I bought my Way there insittument. I had taken my place in a professional orchestra. Now I am making 1990 a work, three times what I made as a cierk. I with everybody knew him easy it is anyone who can whistign time dan learn to play a must-cal instrument."—Hill Corole.

Free Trial—Easy Payments

You may now have any Worlitzer instrument for a week's tree tradin your awahame it samme the instrument, note the fine workmanship the full, such tone value and especially his easy it is to play. No of ignition to buy investment for the trust. We make this less offer he ause we want you to try for yourself a genuine War litter instrument the resident 200 years experience in mose of instrument building.

Easy payments are arranged to suit your con-senious. This is your opportunity to try a fem-ous Wurldter instrument in your own bone.



(Continued from page 109)

The molding will cover mon later on. this opening when it is replaced.

For the same reason do not cut the boards too long; they need not be exactly correct in length, as the molding will conceal any irregularities. Endeavor, as far an possible to use boards that will go right across the room in one piece. When shorter pieces must be used, be sure that the joints in two adjacent strips do not come opposite each other.

The boards are fastened by what is known as blind nailing; that is, the nail is driven at an angle through the board, starting just where the tongue joins the edge of the board. The angle should be about 50 degrees from the horizontal.

SIXPENNY were finishing nails, which are obtainable at any hardware store, may be used for 1/-in, flooring, or a smaller size of cement-coated natis. Regular cut flooring nails should be used, if they can be had, for 1/2-in, thick flooring.

The nails should be spaced not farther than 16 in. apart and if the board is at all warped, it is advisable to place the nails closer together, may 12 or 14 in. It is most important not to damage the face of the boards with the hammer. A punch may be used to drive the nails home if any difficulty is experienced.

If the tongue of a board is broken or battered, it should be broken off carefully with the claws of the hammer so that there will be nothing to prevent the next board from closing tightly.

After the floor is well started, so that there is little danger of moving the boards already laid, a piece of waste flooring or a length of two-by-four may be placed on the old floor against the tongue of the piece being laid, and hammered hard enough to force the new board into place. Be careful, however, not to damage the tongue,

On laying the last board, leave a space for expansion, as in the beginning. If this is not done and the floor becomes damp, it may buige up at some point with such force as to pull the nails. There is then no way of repairing it except to relay the floor.

HE next step is to scrape the wood to make the joints perfectly smooth. This is done with a steel scruper, preferably of a handled type. Scrapers may be made, however, from mowing-machine sections or from old saw blades. Scraping is hard work and perhaps it is advisable to have a professional floorfinisher come in with machines to do the surfacing, if there is one in your locality. Even unscraped floors, if of oak, will be much better than the average floor found in ordinary new dwellings.

The boards next are sandpapered by placing a sheet of No. 11/4 sandpaper around a flat-surfaced block. The dust must be removed by sweeping and wiping or with a vacuum cleaner.

If the floor is of clear selected oak, a natural pasts wood filler should be applied according to the directions on the container. Cheaper grades, which show

(Continued on page 111)



and Smoke Abeter

on the feed door of your furnace. This device a attached to your furnace feed door. Makes ced but coygon with smoke gares over fire brd. Gets more heat from the fudl,

20% Saving in Fuel

We guarantee to cave that much den saves to de l'aver he a cu. Entirely automatic

VRITE TODAY! Full of tree A.B. D STRISTTORS WAN IE A) Profeshir substantial income assured

G. F. S. CO. Stehmand, Ind. 11 Nr. 20th Street sale Canadian Distributors 33 St. Vincent St. hi direct Canada

BIG NOVELTY BARGAINL IO Cts.





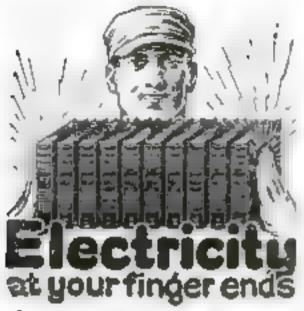
-will start you on the road to success. See Money Making Opportunities on pages 120 to 150



Mondarius New Ziestratyte

charges discharged batteries betantly Eliminates old sulphurie and particol entirely. Dissolves sulphution. World has waited half a century for this invention. One gallon retails \$10.00. free to agents.

LIGHTHING BATTERY CO., ST. PARL, MINN,



Pincer the facts in Electricity. They man more manay and better position for you. Hawkens Garden tell you all you need to know about Electricity Every important about fear and analysis, reversed so you can understand it. Every in study and apply. A complete, jittle rail working course, in 16 volumes. Seeks are opened plants for the large and to-day to look over.

HAWKINS

ANDO PAGES

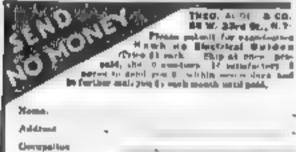
Employed he

SI A WOLUME SI A MONTH These books tell you all about —

Ligarities Industrian Experiments— Dynamics—Ligarite Excitacty Industry Acquaints— Attending at Assuming the Industry point Test on the Industry prent Test on the Industry prent Test on the Industry of Assuming Marine Industrial of Typenom and Marine Industrial on Typenom and Marine Industrial on Typenom and Marine Industrial on Typenom Assuming the Industrial on Capture of Assuming the Industrial of Capture Industrial on Capture Industrial of Capture Industrial Indust

TO YOU FREE SHIPPED

Not access to pay quell you out the books. No obligation to tay out on you are and after the books. Not a beligation and great he polymery and see if the fact of the fact of

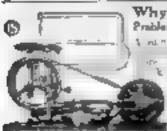








FREE neer 100 sports, hack ups with allowed long. Blows savings up to 50%, on standard radio parts, Send. Late. Because to set this (britty book before you buy. Wondern't Pausinit; You'deav so. Write letter or posts. New PARAWIK CO. 1 p2-1213. Com St., CHICAGO, U. S. A



Why Not Solve Your Sew Problems With This Reputer Took and a ill file its stordy mechanical

between 1" and metal 4" Sola also without metal 4" Sola also without metal, we carry a complete for of brack who dworking machinery. For datalle write to DELTA SPECIALTY CO.

Com much from page \$10)

sap flaws, require a light golden-oak shade of filer

A thin solution of burnt umber and turpentine then may be applied to the light places to bring the flooring to an even color. When the filter has dried flat, which takes about half an hour or less, it must be rubbed off across the grain with a cloth, excelsior, or oakum

Allow the filler to dry hard before applying the first coat of finishing material. This may be floor varnish or white shellar. At least two coats of varnuh or two coats of shellac, followed by a cost or two of floor wax, should be applied. The varnish also can be waxed. if desired.

An old, heavy cotton mitt of the padded kind is useful for applying the wax. Spread as even a coat as possible and when the floor is covered, go back to the beginning and start polishing. A floor brush of apectal design for polishing is cassest to use, sithough cloths or a dry mitt will serve. If the cloths are wrapped about a heavy flat-iron or other weight, the labor will be lightened. The finishing stroke should be with the lay of the board. Hard rubbing is necessary

While a good grade of floor varnish gives a harder surface than was over shellar, it is more difficult to patch any worn rlaces.

Protecting the surface is what counts in the life of a floor. If you go to the trouble of laying a good floor of this kind, it certainly pays to spend the little time nocessary to see that the finish is never worn through .- GEORGE G MCVICKER.

Stopping Doors from Ratiling

WHILE rattling doors, which cause annoyance in many houses, can

A server taken no ell the 'play"

he fixed by the method of moving the strike plate in the door jamb toward the door stop just the right amount, it often

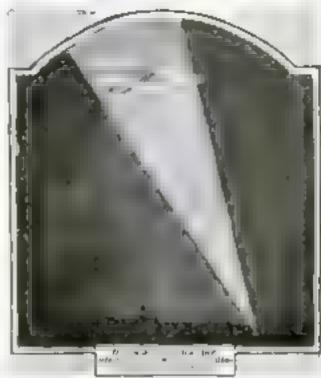
happens that the amount of play in a door is so slight that one wishes for a still aimpler remedy

To move the strike plata even trifle involves chiseling the mortise wider, plugging the old screw holes, and then, if the distance has not been gaged exactly right, filing the plate enough to allow the catch and lock to enter their slots.

The same effect can be obtained,

although it is perhaps not so workmanlike a repair, by inserting a common wood screw into the narrow face of the door stop as shown, opposite the lock, A slight turn of the screw will give the correct adjustment to prevent ratthing.—E. CROSBY DOUGHTY.





An every-night adventure of Burgess Radio Batteries

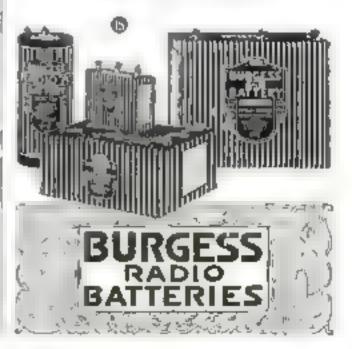
NE of the reasons why you should always buy Burgese Radio Batteries is that the batteries used by air. mail pilots - battleships - explorers—and the majority of recognized radio engineers are evolved in the Burgess Laboratories and manufactured in the Burgess factory.

These batteries are identical with the batteries sold by your dealer and thousands of other good dealers everywhere.

BURGESS BATTERY COMPANY

GENERAL SALES OFFICE CHICAGO

Canadian Factories and Offices: Nagara Falls and Winnipag



Here Are Two of My Champs JOE CANAMARE Walterweight JIMMY MENDOZA Bantomweight Winners of

First Championship Contest Selected and Trained by

JIMMY DeFOREST

World's Greatest Trainer

Here are two of up, Champal. How would you be to be one of them? They were selected to most thousands who have completed the NMA absolute who have completed the NMA absolute with the granteem to my Long Break Mall. The granteem to my Long Break Mall the granteem to my Long Break Mall the granteem of the New York at hour the second of mylety dishest York at hour the second of mylety dishest York at hour the Will y a be one of them?

You May Be a Champion

You have an panch a source on the year fell we naid a second make a collection who see a converted to boys were also rewest above to see a source of the second for my thought to be to see by Mant. The many of for my to a shore the me by Mant. To be many if the more the conservation read in me or a tring and man or a tring and man or a few areas and champion thing a feet

I Will Make You a Skilled Boxer In 20 Weeks

I start with at the very extinuing I seads on step to not every that a read the reserve the every bill of ring etrategy had another every bill of ring etrategy had another the entered from I for Coppe. But from a peak a hour of other frame was not great contenders whom I have to next to be found there when the best we do not be to the large the Copper, that we note that the contenders who have do not the copper of the

Box for Health and Wealth

Busing is acknowledged to be the greatest of all budy could be the developed Music Alexander Pope Sept Confidence engales via to protect yourself and he per a sum for the Pink of Confidence. Many processors such and leasters to all walks of the Bus regularly to been decided policy of the Confidence of the Confidence

If you become a shifted beser you can make more paners enjoy more indicated and freedom han you can by following any other perspection. If it does not being made in the ring by pull who frequent make have broken do englishing. This is the GOUDEN ACE OF SERVING

This Wonder Book Will Open Your Eyes

Read "The Golden Age of Boxing if you want to enjoy the mean few mat my book of its kindless writing it contains the theorems about the its Chamberra and actual ring has then. It restails in tenal how I want for any deviated picture charts I use in my and us toom it can be newly deviated picture charts I use in my and us toom it is out taken a complete outline of my Course week by week, streng at my well brown capp, phases of some of the hald I have trained by Mail. You'll note that is easier back there are trained by Mail. You'll note that is easier back there are to be a trained to be my change your whole the lower deningery and obscurity to Promisence and Wealth. Send too to gover that of mailing and I'll wind you's capp at these. This is You'lk OPPORTIONITY bird the Coupon TODAY!

| L — — — — — — — — — — — — — — — — — — — | AND MAIL TO | nu |
|---|--|----|
| | REST BOXING | |
| grout basels. The | ten cents, for which Guiden Age of Re | |
| obligation on my | (Print Plainly) | |
| Street | | |
| Chy. | se | |



(Continued from page 76)

Old Bill Says—

KEEP objects from under the toolpost washer; they may cause trouble when you are turning a piece of work within close limits.

If the belt is slack on your lathe or on any other machine, have it taken up.

Some workmen never seem to have the slightest notion of what it costs to run a machine shop. They must think the tools can be bought at a 16cent store.

The Stat step in metting up # job is to think out the easiest and quickest way to do it.

A drill press table full of boles

or a lathe faceplate cut up are unnightly and the badge of poor workmanship; both can be avoided with a little care.

Old Bill, machine-

shop foreman

Every job or piece of work you do is a personal advertisement, and it is up to you whether it is a good or a bad advertisement.

When a drill squeaks in the hole, it is often a sign that the side clearance has heen worn away. Trying to force the drill in this condition may result in breaking it.

Carbon tool steel is often superior to high speed steel for putting a good Baish on work.

If you remove the center from the headetock of your lathe for any reason. always plug the hole with a piece of clean waste or a rag to keep out the

A fiat drill will drill certain hard, tough materials easier and faster than a twitt drill.

Burnishing Broach Gives High Polish to Brass Bushings



BRASS bushings and babbitted bearings may be sized accurately and given a high polish by using a broach made as illustrated rather than by reaming. The tool is used in an arbor press and simply is forced through the work. It will do faster work than a reamer, and on soft metals will leave a finish beyond compare. It is made of tool steel, hardened and highly polished. The first tooth should be ground .015 in. under size and the remaining teeth should taper up to the finish size on the last three teeth.-H. L. WHERLER.

Squab Book FREE

Printed in COLORS, Enlarged, Much Naws. Squain are raised in one month, they will for high prices Great est market his 20 years. Make money orresping them. We slip everywhere my slop months in our familia offer raise. For prices might for a court and the slope of the state of the slope of th

Class Rings and Pins

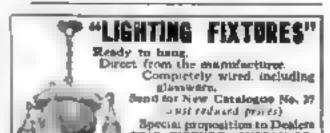


Largest Catalog Issued -FRRE

Samples toqued class officers. Prices O to \$4.00 each No order for class, society or club em-Streetal designa made on re-QUICKL.



METAL ARTS CO., Inc., 7796 South Ave., Rachester, N. Y.



BUCHSTEIN'S FIBRE LIMB

ERIE FIXTURE SUPPLY CO. Donk & Erin Pu-







AUTUMATIC RUBBER CO., Dept. 22, COLUMBIA, & C.



AGENTS 500% GENUINE GOLD LEAF LETTERS

Guaranteed to never turnish. Anyone can put them on sives and office windows. Energy-medemand, large profits, Paul Clark says, smallest day \$28.70. R. L. Reel made 1970 in two months. Write today for free sample and liberal offer to general agents. INSTALLIC LETTER CO., 454 N. Chi. Drni, Chiqu





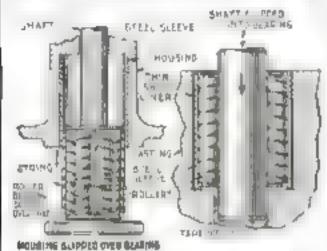


Weiter Shop Methods

Tricks that Are a Help in Repairing Roller Bearings

ASSEMBLING roller bearings of the spiral type usually can be accomplished quickly if advantage is taken of several little kinks that simplify the work

Before alipping a housing over a bearing. the rollers open up and will not enter the hore. There is no room to place a shield or tin ring around them, but it is necessary only to tie them tightly to the shaft with one turn of ordinary string. This will hold them until the housing has been drawn over them and then the soft



Buring used to hold rollers together (at left) and liner for taking up play (at right)

string will tear without interfering with the proper functioning of the bearing

To sisp a shaft into a roller nest, there must be a taper on its entering edge. If the shaft end is not tapered, break down the corner with a file

The replacement of an auto bearing is often costly. Roller bearings of the type distrated usually are used with a split steel sleeve and the wear may be on the inner surface of this sleeve or on the surface of the shaft itself. In either case, the total amount of wear should be determined. If it is desired to save the expense of a new bearing, take up the play by inserting a thin sheet metal strip behind the steel sleeve, as shown. This steel shim stock can be obtained in any width and thickness.

When deciding the thickness of shim stock necessary, make allowance for a few thousandths play. The writer has reshimmed bearings of this type as often as three times. Thin brees also is suitable for shim stock, but in no case use paper -J. V. R.

Drilling a Bent Hole N THE experi-I mental department of a large plant in Philadelphia, the hydraulic engineer required a 1/4-in. hole drilled in a as in the lower

BEND IN BAR SAND BEND IN HOLE piece of copper, STRAIGHTENED BAR

view. This was accomplished by first making a templet and bending the copper, as shown in the upper view.

The hole was drilled, tapped at each end for a plug, and filled with sand. After that the bar was reheated and straightened .- V. K.

Isn't it worth it?

IN THE PAST twenty years, Fatima has been more widely imitated probably, than any other digarette-yet today it is as distinctive as ever, in richness of taste, in mildness, in delicacy of aroma. A few cents more, yesbut you get the real thing. That's the difference



WHAT A WHALE OF A DIFFERENCE JUST A FEW CENTS MAKE

LICCOST & MYSSES TORACCO CO.



If so the WORLD PROGRESS will

send you upon superstances another copy Free containing Suggestions in important as to inventions Newton We any to manufacturers to address to regarding inven-tions they want. Subscription for our year 60 occur. WORLD PROGRESS FUB. CO., INC. 302 Victor Bids. Washington, D. C.



FLY 'agggramm lagge exterior. Nacid che cinera piene sod are to recourse and serate alecters. Use return photo the water or the property of the property of the property of the property of T-2.





ry buy finite m Con Tritue ough with we be Manne for FREE! Typewey ong Manual, lange along obd Ware Mrs. Co., 2141 Shipman Blig, Carrege.

Afdrest



This Lathe in Your Shop

Soon Earns Its Own Cost on Our

Easy Payment Plan

We will ship you any size South Bend Lathe on terms of a small payment down and balance in convenient monthly payments. In this wathe Lathe saves and earns its own cost

Note Our Low Not Factory Prices On Seath Bend Surew Cutting Standard Change Gent Lather

2' Lathe - \$215 15" a 6' Lathe - \$376 18' E 18'

Outck Change Gear Lather in the above sizebe furnished at a slight increase in price.

> shows 16 styles and signs Write for it today.

> > South Bond, Ind.

FREE CATALOG

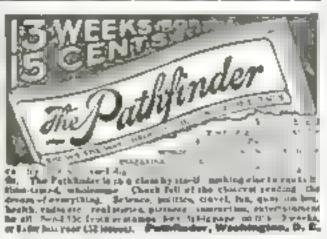
SOUTH BEND LATHE WORKS

SIS E. Madicon St.

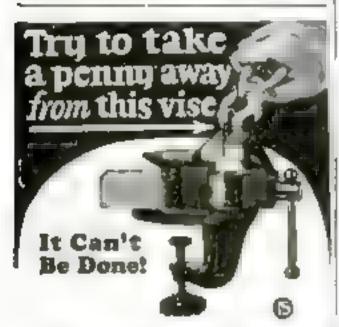
RLANK CARTRIDGE PISTOL PHICES 50c.

gur Le hfg. Pt taken etamber d'ittem abighet la proba-serior manify & 1.00 Puote 190. By otherwa, Sta pay

Johnson Smith & Co., Dept. 462 Racino, Wis.







I takes more than a strong arm and a pear of plans to take away from a Luther Vise enything it's holding onto !

This husey little work-pel has a bull-dog grip that hungs on like grim death! It won't let go until you are ready to have it let go. Has a wider jew spread then any other vice of the same east. Extra heavy steel screw, eccurately machined. Rugged screw aut. Strong, heavy per elled slide ber. All perts carefully machined and fetted together.

Buy this better vise at any good hardware three. Ask for "Luther". Four stand 1/2". a", a1/2", and 3" paw aprend.

> Write for free copy of interesting boolder: "Tighten Up"

DUTHER ORINDER MFG COMPANY andministrates of high quality

Luther seel Grinders,



Musical Popularity

Ability to play a musical instrument always wine popularity. But that is only one of many advantages that come to those who play Hohoer Harmonicas.

Hohner Harmonicas win popularity, admiration and friendship. They stimulate interest in good music, develop a sense of accuracy and rythm, lay the foundation for musical education and supply clean, wholesome entertainment for the player and his audience as well.

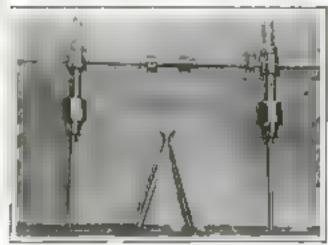
Anyone can learn to play a Hohner Harmonica with the aid of the Free Instruction Book. Ask your dealer for one today; if he is out or copies write M. Hohner, Inc., Dept. 182, 114 East 16th Street, New York City.

"That Musical Pal of Mine"





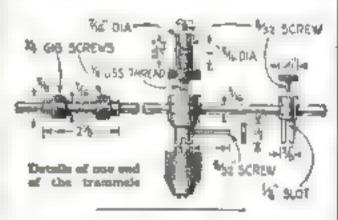
Two Cheap Tap Wrenches Used in Making Trammel Points



TWO tap wrenches bought for 25 cents such were used in making the machinist's trammels illustrated. The wrenches are clamped to the beam, which is flattened on top, by means of knurled screws.

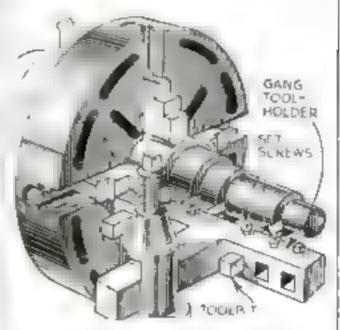
One point has an auxiliary screw for fine adjustments.

A swivel handle at the top of each tram is an advantage, as it enables the trams to be swung around more conveniently. The points and callper legs can be made to suit individual needs .- D. T.



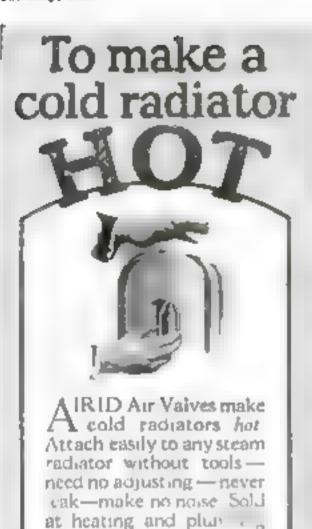
Gang Tool-Holder for Facing Shoulders on a Lathe

FACING several shoulders on repetition work can be done at the same time with a gang tool-holder such as is illustrated. This effects a saving of time and assures that successive pieces will be duplicates,



Several tools may be held in this holder for facing shoulders on duplicate meres

The tool-holder is made of machine steel, and high-speed steel bits are hold in the slots with setscrews.-G. A. L.



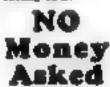
AIR VALVES make cold radiators HOT

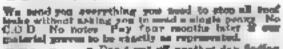
stores. Only \$1.60

AN ERRORN RADIATOR OF MEAN Y \$1.5 Empland Ave. Bullan er a look resource and sort to a Posterso. A 5. 33

Make Your Roofs Last a Lifetime!

Fullively that! The wonderful lead Tite method yenews, gracerum and take to be not old, tromest their waters, it. One application leads for this great money-saving scooling of w.





Write I Don't put of mother day finding out all about this wanderful way of solving all your roof problems. We'll make you an offer an illustry as what, so surprisingly approcedented that you shaply MUST take advantage of it at once. Don't wait for rain to compiled you that your read leader. Write TUDAT!

Mesarch Paint Co. Sept. 13-02 Cleveland, O.

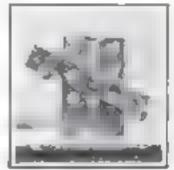


How to Avoid Failure in Making a Sine Bar

ROM the standpoint of the machinist or toolmaker who has to make a sine bar, the design Illustrated below has the advantage that there is no danger of grinding and lapping the center distance under

size, which would entail scrapping the work

If it should be ground or lapped under the finished size, the button-resting surface opposite the 35-degree angle is ground or tapped a suf-



Set up for the

ficient amount to correct the error. The same means may be used to correct the bar if at any time it should "go out" because of the distortion of the steel This cannot be done with an ordinary

The buttons may be flush with the sides or left projecting at one side, as desired. When flush with the sides, they do not permit as great an angle to be measured, but they will serve all ordinary

NO 6-32 SCREWS (HEADS COUNTERBORED)



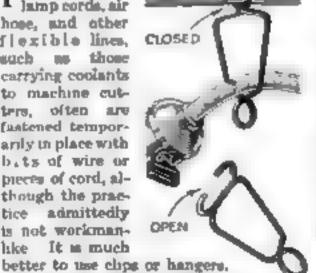
Details of a situ bor which may be made targer or unuffer to enevt special conditions

purposes, as the bar may be used with either side to the angle plate.

The button distance may be increased if a larger bar in required, but the 3-in. size is handy for small work. The holes for the acrews that hold the buttons are at an angle of 45 degrees. The plugs and bar should be made of a good grade of tool steel, hardened, ground, and lapped all over with the most precise accuracy.-E.T.W.

Wire Clips for Lamp Cords or Air-Hose Lines.

DORTABLE lump cords, air hose, and other flexible lines, such as those carrying coolants to machine cutters, often are fustened temporarriy in place with b, ts of wire or precess of cord, although the practice admittedly is not workmanlike It is much



By bending bean spring steel wire as shown, a type of chp may be made that can be attached to all kinds of supports and put to many different uses. As any scraps of steel wire can be used, a set of these clips need not cost a cent. -GEORGE A. LUERS.



He had the right idea

Other fellows had left him in the social background. Girls avoided him, He was missing all the modern fun because he had "nothing to offer to help others have a good time." And he knew it. Then one day he read an advertisement. It held out a promise of popularity if he learned to play a



He knew that was the right idea. He had known it for a long time, but he thought he was musically dumb. "Stil, the ad said it was easy." He mated the coupon, and later cont for a Sasophone for 6 days fros trial. Before the end of that period he was playing leasy tunes. That was three months ago and today he's the shelk of his est. He's making nice aldo-money too playing with a local dance orchestra-

You Can Do It Tool If You Try

Anyone who can whistle a tune can meeter is quickly. I leavent free with each new instrument teach scales in an hour and within a week start you playing popular tunes. From them on its great fun learning, and even though you re only interested for pleasure now you can be so days, if you wish, join a hand or orchestes.

Six Days Free Trial . Easy Terms

You take no risk when you order a Buescher for yourself or for a gift. We will send you any instrument you choose, Sesophone, Cornet, Trombone, Trumpet, on als days free trial, This places you under no obligation. If you like the instrument and decide to keep it, pay a little each month. Get the details of this wonderful plan. Citp the coupon below. Send it for the free literature. Send it today. Now.

BUESCHER BAND INSTRUMENT CO. Everything to Band and Occhestra Instruments Elkhart, Indiana 1357 Burnelsoy Block



This 64 page book tells about the carious models with pictures of profes-atenals using them. Send for capy of this wonderful

SAXOPHONE

Clip the Coupen NOW!

Busscher Bend Instrument Co. 1357 Busscher Block, Elichart, Indiana. att interested in insurument checked below Secophone | Cornet | Trombone | Trumper | (Mercion any other interested in) Street Address.....

Machines Win or Lose—on a Dial

Invention, designing, machine development: -all lead up to the record on a COUNTER. What production?

On the dial of the Counter the game goes on. Gains in production-good moves mechanically. Losses due to mistakes in mechanum or operating-method.

Your new machine may beat all, potentially But where you see the winning score, where you see what "plays' made Goal 18



on the dial of your

The large Re-Set Revolution Counter above rerords the output of any machine where a shall revolution indicates an operation.

Sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price with four figure-wheels, as illustrated, \$ 0.00 subject to discount. Cut has then sno-half stee. Set-Back Rotary Ratchet Counter to record recuproceting movementa as to presses, \$1150 mac.)

Speed Counter

Here's the handlest instrument for finding revolutions-per-minute of a shaft or flywheel. You hold the top of the counter against end of revolving shaft, press lightly when the second hand of your watch comes to 0; release pressure when nations in up. A spring chitch controls the recording mechanism.



(Cut less than 35 size)

For keeping motors, generators and machance running at efficient speeds. Price, with two nibber tips, (as illustrated) \$3.50.

FREE: The foremost booklet on Counters, to help in your development work.

The Veeder Mfg.Co. 44 Sargeant St., Hartford, Conn.



How to Make a Press for Relining Brake Banda

By Frank N. Coakley

FOR the garage man or other mechanic who has a great many brake hand renewal jobs, the press illustrated is well worth making. No patterns or castings are required. All the parts are especially heavy so that the press will stand hard usage and will serve for other purposes. The maker can use his own judgment in the matter of sizes, however, and he guided by his own requirements and the scrapmaterial available in the shop junk heap and claewhere.

The main frame is a length of 10-in. Ibeam. It either is set in the floor in concrete or isstened to the end of a bench To the top of the beam a 14-in, plate 2 in. long is riveted. This plate supports the 314 by 7 in. angles, that act as the aide guides and the fulcrum plates for the top lever. This lever is 2 ft. 6 in. long between the centers of the pinholes.

> The ram end is drilled for a Ja-in, pin. The rod end is provided with a ½-in, hole.

Regular brake-rod ends can be used as connections for the pull rod, which is provided with a turnbuckle for adjustment. The ped-

6'at' al le built from ANGLE & piece of % by A email piece of angie is riveted to the end to provide a foot rest. A piece of 3 4 by 7 in, angle is riveted to the sprine beam to act as a fulerum point for the [oot]ever. apring to provided as shown to act as a pull back for both

Side view of press and section through ram

SYNETANGLE, ILL A-A

JE HIX 211 FLAT

3467 AH6LE

2º I

ICTI-BEAM, 4

the top and the bottom levers.

A shelf made from a plece of 6 by 6 in. angle is riveted to the beam 2 ft. 6 in. from the floor. A hole is provided through which the riveting block pin projects so that it will be kept central.

The ram of the slide is made from a piece of 2 by 3 in. flat steel. A hole in drilled in the bottom to hold the riveting punch, which is held in place by a ectscrew. The top end of the ram is rounded to allow the top lever to slide on it enally.

A strip of brass is placed between the ram and the beam. A piece 2 in, square is bolted between the two side angles and acts as a front plate. A slotted hole is provided in the lower and of these angles to allow a pin in the ram to slide up and down. To this pin two aprings are fastened to act as a pull back for the ram.

GLASS may be filed with comparative case if the work is done under water. This insures that the file will not become dull so rapidly





STEARTS PLAPAGE PADS are different to on the class. Indicate the continue of a place of the class to the clas



total model came conquered. Saft at Grant citi toleral many to apply incomension. Awarded orid Mer al and Grant Pris Prisons of recovery in the one to private the control of the prisons. We prove the prisons of the prison of the prisons of the pr ANIME

Return mad will bring Free Tels (Tapon)

Guide brighted as well-dead of the present state over life angels book upon a lating and an action of the present and supplies. So sure to a latin at the first state of the product of the many in your pocket. He is not and guaranteed productions of the production of the present of Constitute of profes our Ares places confinite to the Arest of the Confinite Confinite



Better Shop Methoda

Clamping Fixture for Filing Small Pieces at an Angle

FILING an angle on a large num- w ber of small pieces often may be made easier by the conatruction of an auxiliary clamp or fixture of the type illustrated. This is a piece of flat steel bent to suit the work and held in the beach vice.

SHAPER-

FINISHING



FILING CLAMP

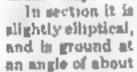
The band should be such that the two sides of the fixture will be approximately parallel when the vice town are closed upon them.

Elliptical Shaper Tool Insures a Smooth, Shearing Cut

SQUARE-NOSED tools tend to dig in when finishing tool steel, or alloy steel in the shaper or planer, which makes it difficult to produce a smooth surface. The |

tool shown, if used for this purpose, will lasure a good finish.

It is forged in one piece of the heat grade of carbon tool steel, high speed steel not being recommended, and h tempered in the usual way.



5 deg. so that the cutting point is about midway of the blade. This gives a shearing action

A finishing tool

The tool is to be used only for finishing with a light cut and a fine feed. Use oil for best results.-H L. W.

Chuck for Round Blanks

GEAR blanks or similar work, may he handled very rapidly and accurately for facing or reaming in the chuck illustrated, which is gripped in the usual The spring hole is

four-jawed chuck. drisled, the end aplit, and the clamping screw is put in before the the bole for the blank stock is bored. The clamping screw is tightened a little before buring so that the chuck will release the work readily



A guick-acting chuck

when the screw This type of chuck may is loosened. be used again if it is trued up carefully at the first setting, or it may be bored out when necessary to take a blank of larger size. -B. W. BROWN.



TO YOUR DESIRES





SHOW CARD LETTERING Learn at Home

Hum is the very course you need if you went to get a good maying position as a Show Card Letterer or Sign Letterer, or have a husbress of your own, This course is complete and pray its and especially arranged to meet be needs of the student who student at home. It was written by F. I. Kuller Promised of the School of Art of the International Communication of the American Enternation dence Schools, member of the American Federation of Arts, and The National Society of Craftimen.

Mr. Koller has had twen y years teach ag experience, and his sources in he may subser men and women. is an indication of what he can do for you

H. L. Word a rierk made more than \$700 "on the side" before he had crossitered his course and also wen \$125 in private. Harry W ham Lord writes that he has more than doubled his valuely as a resist of studying this I. C. S. course in space time William Whitman, a farmer wagon builder, now has a sign painting busine, of his own and is earning percent there is now has a sign painting busine, of his own and is earning percent there is no had before earning. with the International Correspond are Schools.

There is no doubt that Show Cam latering and film Lettering offer a reas supertunity to assist our men and world planty next your a broker telling all about the I C S course in Show Lant Lettering, or any other subject to which you are interested.

INTERNATIONAL CORRESPONDENCE SCHOOLS Sex 7077- D. Berant a. Ponns

The aldest and interest correspondence achieve in the world Without copy or not go on on my part, please tell use book I cuts due life for one positions or in the publical before withink I have marked use X.

DANOW GARD LETTERING

(date attanebly Sale-disarrers

Adjust they

He or let and

Recognition and Typing

Has been English

Cir. Service

Ha way Mat Clerk

Commen Fabort Subjects

to Method Bubberts

The Comments Silimbrolling

TECHNICAL AND INDUSTRIAL COURSES

Electrical Engineering
Electrical Links og
Michael Continuer
Michael Step Practice
Baines Step Practice
Baines Problem
Cut Engineer
Surveying and Marming Electric Links of Applied Chertain Respective Electric Links of Contract of Architecture Engineer Chertain Story Processes of Architecture Engineer Chertain Engineering Chertain Engin

Name

Carebbert

| Nevert Ashirem. | |
|-----------------|-------|
| City | State |



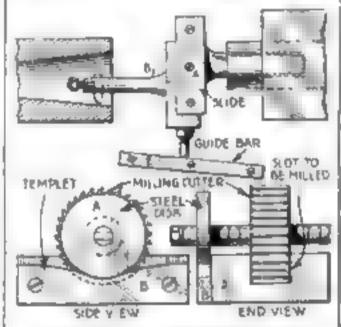


Detter Clay William is

Two Ways of Simplifying Difficult Milling Jobs

ON OCCASIONS when it has been necessary to hore a tapered hole with a milling machine, I have used the method shown in the upper view of the accompanying Illustration. The guide bar was set on an angle corresponding with the desired taper and fastened to the milling-machine table in the most convenient manner. An adjustable boring head of a common type without transverse screw adjustment was inserted in the apindle to earry the boring tool.

The head slide was provided with a contact piece to strike against the guide bar at each revolution of the spindle The work was advanced with the finest



Boring a tapered hol and using a templet in militag a groove of irregular contour

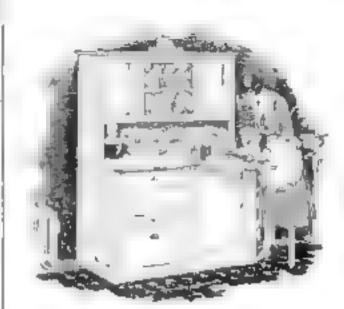
possible feed and the slide, of course, followed the guide bar much the same as a gross slide follows a taper attachment on a lathe. A similar net-up can be used on a drill pross when you wish to bore a tapered hole.

Another kink I have used in the method of cutting pregular contours in odd shaped pieces and eaths that is illustrated in the lower view

In this instance a groove had to be cut in a steel block. A templet was made to correspond with the desired shape and attached to the piece to act as a profiling guide. A steel disk of suitable diameter was put on the arbor with the mill and so located that it rested on the guide plate when the mill was in a posttion to make the cut. The templet was held in contact with the duk by manipulating the vertical and table feeds of the machine.—CHARLES KUGLER.

Making Special Nuts

SO MANY uses are found for bezagon stock that it pays even a small shop to keep on hand a few bars of the more common sizes. This stock is especially useful when special hexagon nuts are needed. The only work required is to drill and tap the holes and cut off the nuts, facing them afterward on a thread arbor. This is so much quicker than machining the entire nut that the time saved more than warrants the expense of carrying a few bars of stock.—H. L.



Save \$44.00 on this Beautiful White Enameled Kitchen Cabinet

THIS handsome whiteenameled kitchen cabinet would cost \$65 if bought in a store. If you are handy with tools you can make it at home for \$21-or less. A clear saving of \$44.

One feature of this callinet is a self-contained seat. Another attractive feature is the roomy china closet occupying the middle section of the top of the cabinet.

Besides the china cupboard, the top section contains a flour-bin and a closet for sugar. spices, and coffee. The bottom section has one large cupboard and three drawers, the lower one being a metallined bread and cake container. There are two large boards that pull out.

Ablueprint with full instructions for making this beautiful cabinet can be secured by sending 25c to

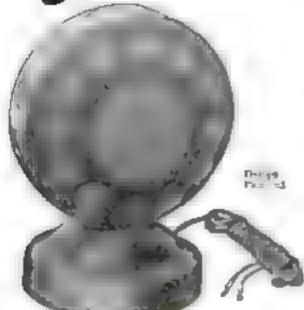
POPULAR SCIENCE MONTHLY, 350 Fourth Avenue, New York

| POPULAR | SCHENCE | MONTH | R.Y |
|---------|-----------|----------|------|
| 250 Fo | narth Ave | nuc, New | York |

| Enclose | ed us 25 | ic for 1 | which ph | sase send |
|-----------|----------|----------|-----------|-----------|
| me your | bluepr | int for | Kitchen | Cabinet |
| including | all the | : latest | : fegture | 5 |

| Name | | |
|---------|------|--|
| Address | | |
| City | | |
| State | | |

Loud Speaker Sensation.



LOUD SPEAKER

An exact replies of the transmitting microphone used in broadcasting stations.

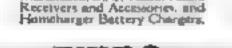
The efficient KODEL SOUND UNIT, with an ingen our new mail-shell horn, enounted to use the m crophone case, produces a re-markably class, full-toned volume, with every note as rich and true as when it enters the transmitting interophone in the studio. Non-vibrateig tone chamber absolutely eliminates distortion.

315 Model incor-parates new Lodel, 2r. post; with large Endel mail, \$20.

Stadio dealers everywhere have them,

THE KODEL RADIO CORP. 500 E. Pearl St. Cincinnuti, O.

Manufacturers of Kodel Radio







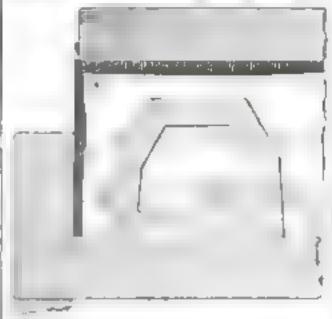
Design Slop Me sho la

Draftsman's Templet Saves Time in Drawing Threads

RAWING serew threads, which is a time-consuming detail in the work of every mechanical draftsman, can be expedited by the use of a templet made as shown of celluloid, wood, or hard rubber

A prece of material 1/16 by 4 by 5 in. makes a templet of a handy size, but the dimensions can be larger or smaller, to suit the Individual requirements.

The angle on each side of the upper half of the templet in 30 degrees from the



Thresded parts may be drown u sickly m. machine details with this disfit ig templet.

perpendicular and is used in drawing the thread proper. The angle of the sides on the lower bulf is 4 degrees from the perpendicular and is used to draw lines repesenting the pitch. The inside and out-.de angles are the same because often it is convenient to use both at once.

While the angle representing the pitch is not correct for all threads, it is a mean between a standard 34-in. and a 1-in thread and is as securate as ordinarily is required for routine mechanical detailing .- BOYD R. ALVORD.

Easily Made Expanding Collet

FOR facing small pieces in a lathe, the expanding chuck or collet illustrated below is especially useful.

A length of round stock is turned at one and to suit the work to be held, the reduced section being slightly shorter than the thickness of the pieces. A hole



A simple church of expansion type for bolding small parces that are to be faced in a lathe

is drilled and reamed in the end of the collet to take a taper pin. Another tapered hole is run into the first hole to take a knockout pin. The end finally is slotted as shows.

in use the work is placed against the shoulder and the taper pin is driven into the end hole.-R. H. KASPER.



Greater **Improvement** Than Was Thought Possible

Never has a B-T product met with such instant enthusiasm as greeted the Euphonic Audio Transformer Many believed such improvement impossible but a single hearing left no room for doubt.

B I research has succeeded in creating a transformer with an iron core placed to better advantage and coll with 50% more turns than asually employed

It costs more to make, but after von lear Euphonics you'll agree it's worth while.

READ

What J. E. Martin, Konsas City, says of the B-T "Counter phase"

The Counterpiece is in every parneular by far the most efficient receiving set that I have owned or heard in operation.

One stage of audio is quite sufbeient for ample loud speaker reception in five rooms of all class B stations in the U. S., and many class A.

And this from Cincinnati.

Summarizing tests on Counterphase Set I can safely say it has more volume, greater selectivity, greater sensitivity, and produces higher quality of reproduction than any receiving set I have ever heard.

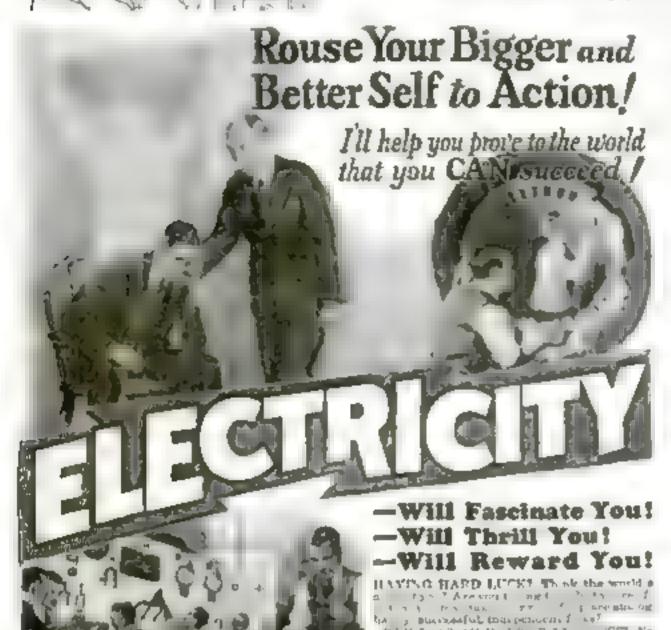
From Ft. Wayne, Ind., Oct. 16, 1925 I consider "Better Tuning" one of the best and most sensible booklets ever issued by any radio set manufacturer.

Circulars for the asking. "Better Tuning." 80 pages, 10c,

532 So. Canal Street, Chicago



Readers of POPULAR SCIENCE MONTHLY will find scores of opportunities in this section (pages 120 to 150) for making more money.



HUNDREDS OF COYNE-TRAINED MEN EARN \$60 TO \$200 A WEEK

RLECTRICITY is a vast field of rich opportunities! It offers clean work steady employment. Bits PAY to men who are properly trained. It etherideal

field for regular fellows—HE MEN -who want to get above in the Third truly he BUSCTRICAL AGE and your day of opportunity

COMPLETE ELECTRICAL TRAINING

In 12 Happy Weeks at Coyne

Send For My Big Free Book and Special Offer of 2 Extra Courses

Surprisingly Large, Handratte and Complete Dectrical Sock Code You Nothings New or Later

Two card principal a great his bandsome, business of options floor beat want to early you make the first band of the principal was and purchases at 12 april and principal and principal

SEND COUPON NOW

the first process and the same of the Contract of the Contract

Char B. C. True can hart bat I was a find the condition of the condition o

Manager .

I have perfected an update receipt of instruction in Electricity a course that is absolutely thorough that is easy to master that reverse every single phase and factor of the squeet that the map for the MCG meetrical joins—the EUOM-SALABLES straining join.

COVER does not taken by correspondence, but by gractical personal training in the wonderfully equipped CDTME Shops, located in thicago, the electrical center of the world. At COTME your training at really PER-ON U. and PER-CTIC U., on the most MODFRM and COMFRETE electrical apparatus, under guidance of thoroughly-qualified instructors. You also visit great industrial organizations and gover plants.

Turne in on COYNE Redio Station WGES

COYNE ELECTRICAL SCHOOL

There is no Substitute for Personal Training, in Great Shops, on COMPLETE Apparatus

Every reader of Popular Science Monthly is invited to enter this contest—

\$100 in CASH PRIZES

For the best letter of 150 words or less answering the question—

"What advertisement in the 'Money-Making Opportunities' Section interests you most—and why?"

we will pay on February 10th, the following cash prizes:

First Prize \$50.00 Second Prize 25.00 Third Prize 10.00 Fifteen Prizes of \$1.00 Each 15.00

First read every advertisement in the Money-Making Opportunities Section on pages 120 to 150. Pick out the one that interests you most and then write a letter—not exceeding 150 words telling us why you find the advertisement you have selected the most interesting.

Entries for the contest will close on January 1st. The prize winners and their letters will be published in the March issue of POPULAR SCIENCE MONTHLY.

Address your letter to

Contest Editor
MONEY-MAKING OPPORTUNITIES

POPULAR SCIENCE MONTHLY

250 Fourth Ave., New York

From an Idea to the Greatest Man-Building Institution in the World

—And What It Means to MenWhoWant to Attain Independence

By J. E. Greenslade

Read What They Did

\$12,000 n Year

A II War Change left a mark in, phi Now is averages ha. 000 a year as a salraman.

\$150 to \$500 a Month

W. P. Clenny of Kamas City

REQUESTS for more than 50,000 salestion were received by the Employment Service Department of the National Solesmen's Training Association during the past 12 months.

Wholesafers, manufacturers, jobbers and other employers of salesmen all over the North Austriana Continually re-

cruit the realest accession the ranks of N S 4 A

Memberii. Surely that is unques-Linnal le proof of the great demand for salemen and a great tribare to the Asecclation. And yet, only a little over eighteen years ago the great Institution, hea squarters for Scient fig. Sa esmansorp, was but an steel. Today the Association can exceber its Members in the tens of thourands, all over the English speaking world -and thouparen of them have attained financial relepontlence as a result of the training they received with

the Association

It has always been my personal belief that it is better to do one thing Whall than to do several things in a mediocre ashion for this reason myself and my associates have never attempted to teach other subjects. Salesmaniship is a never-ending study—and in over eighteen years the Association has never let up in its search for new ideas.

Not a "One Man" Institute

No one man has been responsible for the N.S. T. A System of Salesmanship Iranies. No matter how brains or successful one man may be his viewpoints and ideas must necessarily be prejudiced and limited.

Thousands of master minds in selling have contributed to the N.S. T. A, text—and will continue to contribute to it. Many leading saids authorities are ACTIVELY insentified with the association at the present time, with a nationally known company,



Why Dodge Better Pay?

If thousands have succeeded in a big way as a result of N. S. T. A. Training most of them, men who had never sold a dige a worth of goods in their lates before engaling in there any reason why 101 smooth not succeed in the greatest of all professions—schemansh p?

No man is more important in his ness than the sur man. He has the let berthase he to the MOTIVE POWER has kind any business. And you can quickly a alless y learn the secrets that make Mastir Subsemen. Inside twenty weeks you can scart out as a lity or traveling subseman. Airt fied with the knowledge that has chabled thousands of our Memoers to step from poor pay to hig care age.

This opportunity is before you NOW—backed by a Money Back toparantee. Are you going to be a wage slave 0 is time next year when there are the sands of openings waiting for men who KNOW HOW TO SELL.

With My Compliments— An Amazing Book

It will not obtigate you to fit in and mail the roupon sciow. And you owe it to yourself. I want you to get the fa to -t ien decide for yourself. This book. Modern Salesmanship," was prove a revelation to you. Let me send it

to you had certainly ought to read at if you want to make more money. And who doesn't?

NATIONAL SALESMEN'S TRAINING ASSOCIATION

Dopt A-16 l. S. T. A. Building, Chictay, Ill.



tion. M see to from a \$ 50 am with the tall \$100 a month. One month he made \$850.

M V. Stephens of Albany, Ky was making \$25 a week, the took up this training and new makes 5 times that much.

Small Pay to Big Earnings

J.D. Cash of Adams of a exchange on 1.5 g = 1.5 a b f newhist pays block 500 amount

How the N. S. T. A. Originated

Twenty years ago when I was hales Manager for a nationally known firm that employed hundreds of salesmen, I found that my sales letters and bulletins helped my men to increase their sales. In one year, as a result of weekly letters and bulletins to the man in the field we increased our business \$32%. Is it any wonder that I conceived the idea of teaching salesmanship by mail?

With the assistance of a few able friends in the profession the Association was formally launched in 1907. Lorlay it is the largest and oldest Institution in the world specializing in Salesmanship Training.

Is it any wender that our Members make good right from the start when the proved plans, wisdom and experience of hundreds of sales authorities are laid before them?

No institution can guarantee a man success. but the N.S. T. A can guarantee to give any man the finest training in sales-manship in the world. It can guarantee that no other institution can produce the same exidence of ment or offer as much for the nominal futtion fee.

Furthermore, the N.S. T. A. has an ironclad. MONEY BACK, GUARANTEE, as tangible evidence of merit.

EMPLOYERS are invited to write to the Employment Dept. of the N. S. T. A. We can put our members. Employers are also cordially invited to request details about the N. S. T. A. Group plan of instruction for entire salm forces. Synopsis and charts sent without obligation.





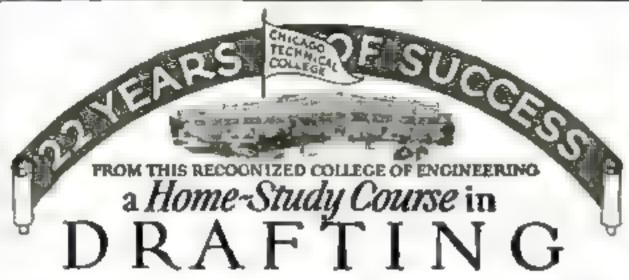
Dept. A-15

N. S. T. A. Building

Chicago, 111.

National Salesmen's Training Association, Ouet A. IS N. S. T. A. Elda Chicago, III. Sand on FREE, most book "Modern Salesmandalp," and offer I can become a Master Salesman. Name

Ad Green
City State
Age Occupation



Everything today is built from drawings made by Deaftunes. Industry calls for 50,000 new men yearly. Draftsmen work hand to hand with the architect, the engineer, the designer, the hunder. And thus many men rise from such positions to be heads of great contractors' organizations, directors of railrosus, thicl engineers—responsible positions commanding

Prove your fitness and liking for one of industry's highest paid professions. We want you to know what Drafting is like ... how readily you can progress ... how we train and teach you by mad. So, before you enroll .. FRFE ... without cost or obligation ... we send you a trial lesson to study in your own home.



Mr Course Residence

Several years ago, Mr. Roudanez-then the Machadeal Department of Chicago Technical Culeng The College Employment Bureau placed human his fact two postsions. And today, he is President and General Manager of the Economy Cump of Machine Co. His regist rise he attribute to the neural and historical attribu es to the sound and horough training received at Chirago Technolal College. What this training has done for hom it will do for any man ambituous to increase his carpings.

NOTICE—A wall established Placesters bu-reau amoust both graduates and undergradu-ates to find positions.

Within Ten Months Increase Your Income

No special training or talent in required. In 10 months' time or less . . . we can train you . . . at home, in your spects bours . . . to be an expert Drafteman.

And remember this In Draftons, a big income is open to there's prince of trached mars. The consists to stay are cuts by \$15 to \$100 per week. The reason is simple: Good Draftemen. are in constant demand.

Book of Facts FREE

We will send you a 40-page Book. It tells you all about and our courses. What price and men my Drafting where Dra tamen are employed their salaries what out studen a have done and there seemant en how many have shoreared their mileties of before freshing the scourage . Dow many bold high-an-nowl ever dive positions a day. Tells how J4 matrices an give you're on too recognised Li-year-old colleges practical. short, bothe-study course.

The Coupon Below Means Money to You

Find out what Drafting may mean to you . . . mail that tempon. Here is a field in which you can work and win

We make the test easy, for, with no obligation, we send you a trial lesson FREE. Note the fairness of this offer, the absence of enugerated promines.

\$25 Qutfit Included

When you enroll, you will need drafting instruments; so included in the cost of the course to a \$75 tifetime set. If you have instruments, credit will be allowed. Note that we do not make to give you these instruments "free Turion in tow, payments easy.

In Chicago—Earn While You Learn

Those who can come to Chicago will find opportunity to care living expenses in part-time positions, mixtude of school bours, while attending day or evening classes at the findings.

Chicago Technical College, founded 1904, is known as one of America's oldest and largest schools of

specialized engineering. Over 4000 men caroll in rendent day and evening courses yearly.

Diplomas in Civil, Mechanical and Electrical Engineering and Architecture granted after two years. Degree of h S. conferred a refer to rain the law course. Short courses offered to Drafting. Plan. Reating, Estimating, etc. Evening classes for day workers.

If merested my tending Day or Evening Coasses at the College in Chicago waite for \$2-page CBlue

Book"-mailed free.

Send Today for FREE Trial Lesson Fill Out the Attached Coupon NOW

Drafting-Bugineering-Electricity-Architecture . . . all branches

| Сансаро | Tochus | وع ليصا | dege, | | |
|---------|--------|---------|-------|----------|-----|
| Dent 13 | t. Itt | B. 260 | h St | Chicago. | 14. |

Send mr. without cost or obligation, your FREE Trial Lesson and your 60-page Book. 1 of Facts about Deafsing,

Name

Address

City and State...

in the November Contest Five members of the World Oppor-

tunities' Society will receive scholarships in the Coyne Electrical School as a result of Mr. Calder accord this school's advertisement in the columns of POPULAR SCIENCE MONTHLY. Here is Mr. Calder's letter which wins the first price of \$50.00 in the November Contest:-

DEAR SIR

The advertisement of Coyne Electrical School in the Money Making Opportunities' Department caught my interest because it offers a permanent and progressive apportunity -a well paid profession of constructive service.

I decided to investigate their offer. I called at the school and found it an institution of such merit that I was most favorably impressed.

This I reported to the Committee on Scholarship of our Fraternal Order. Upon deliberation the Commuttee decided to offer five annual scholarships in the Coyne School for our members.

See what that one advartisement accomplished!

Yours truly,

M. CALDER.

World Opportunities' Society, Chicago, Illinola.

Complete List of

In the November Contest

FIRST PRIZE \$50 M Colder, Chicago, Ill. (Cayne Electrical School)

SECOND PRIZE \$25 Russell 3. Landeen, Ferest Lake, Minn. (Niegara School of Music) (American School of Aristian)

THIRD PRIZE \$10 Peter Hursig, Hawleyville, Com. (Theo Andel & Co.)

PRIZE WINNERS who received \$1.00 each for their letters-

Leland Perry Coder City, Utah, Chicago Engineering Works) William F. Bendmann, Ft. Wayne, Ind., Victor J. Evens & Co.)

Frank S Certy Chicago III.
American Correspondence Schools Arthur W Zahel, Eagle Rock Callf. International Correspondence School

M H Johnson, Omaha, Nebr. Attest Merby Institute, Inc.) Berold F Reed, Nugara Palls, N. Y.

Tierorio Stemp Co.) J N Laurence Marc Island, Calif. Pathtuder Publishing Co.)

Dan Sauer Denver Colo. (The Welden Fice Gan,

Lymm Michaels, Bristol, Com. They Andel & Co.) Harry B. Stillman, Plainville Comp.

(International Correspondence School) Limer Brane, Springfield, Ohio.

Leon C. Merryfield Burgoon, Ohio Northwestern School of Taxislermy)

A. S. Bailey Houston, Texas National Subsements Training Assects

Chirles M. Reynolds, Spruce Crock, Ps. (Chicago Engineering Works)

Clarence H. Christopherson, Delavan,

Minp. (Dryne Stackwood School)



Look What These Cooke Trained Men Are Earning

Makes \$700 in 24 Days in Radio

"Thanks to your interesting Course I made over \$700 in 24 cays in Radio Of course, thus is a little above the average but I run from \$10 to \$40 clear profit every day, so you can be what your training has done for me 1 (1), 349 Horing St., Atlanta, Georgia



1 C M

570 to 680 a week to Jacquet

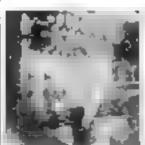
"Now I am specializing in Auto Electricity and barrery work and make from \$10 to \$30 a week and act, sat gering started. I don't behave there is another school in the world like yours. Your leasons are a real joy to study."

7 JACQUOT, 1885 W Colorado Ave. Calorado Springe, Colo.



\$20 a Day for Schrock

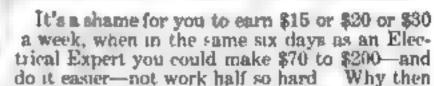
"Tips my name as a reference and depend on me as a boost-er. The biggest thing I ever did was answer your advertisement. I am averaging better than \$300 a month from to make \$15.00 a week." A. SCHERCK, Phonois, Arisona



Plant Engineer-Pay raised 150%

"I was a dambbell in electricity until I got in touch with you Mr Cooke, but now I have charge of a hig plant in-cluding 600 motors and direct a force of 34 men—electridans, helpers, etc. My salary bas gone up more than 150%.

GEORGE II tank, worth, the Column Road, Holysia, Man.



remain in the small-pay game, in a line of work that offers no chance, no big promotion, no big income? Fit yourself for a real job in the great electrical industry. I'll show you how

Be an Electrical Expert Earn \$3,500 to \$10,000 a Year

Today even the ordinary Electrician—the "acrew driver" kind—is making money—big money. But it's the trained man—the man who knows the whys and wherefores of Electricity—the Electrical Expert—who is picked out to "boss" the ordinary Electricians -to bose the Big Jobs-the jobs that pay \$3,500 to \$10,000 a Year. Get in line for one of these "Big Jobs." Start by enrolling now for my easily learned, quickly grasped, right up-to-the-minute, Spare-Time Home-Study Course in Practical Electricity,

Age or Lock of Experience He Drawbett

You don't have to be a Course Man: you don't have to be a High School Graduate. As Chief Engineer of the Chicago hagintering Works, I know exactly the hind of topology you need, and I will give you that itaining. My Course in Electricity is simple, thorough and complete and offers every man, regardless of new substation or previous experience. The charge to between an avery start time, an "Electrical Expert," able to make from 170 to 200 a work.

No Extra Charge for Eleptrical Working Outfit

With me you do practical work—at home. You that right in after your first few enous to work at your profession in the regular way and tooks and I give them, your spare time. First he you need tooks and I give them, to you. Shirp complete working outlits, with tooks, measure lag instruments, and a real electric many—5 spills in all,

Your Setisfection Couranteed

So take up I that you can test a Election's error and I that after south ray with our yout, but can get this the "tag manny class in electional work, that I will guarantee and are bond to return every sing a permy part are to tall end. []. makey class in electrical week, that I will guidenness under bond to return every sing a permy four me to thi em. I,
when you have for sheet got i come you are not destined. It
tens the best investment you every fracts. And back of me
in my postureter, stands the Change Englisheding Works he is two me hands on no statum,
then meaning locarry student simularities only
a word with training a keeptracty but an ungorpassed Student Service as well.

Get Started New Mall Coupen

I want to gend you me
I want to gend you me
I want to gend you
got hims and
you if an jay
there Make tost
of any to himself for the
himself for t

h height future to tweetricity.



L.L. COOKE, Dept. 34 2150 Lawren Ave., Chicago

The Man Who Makes "Bap Pay" Men

Send ment once without obligation your big i lustrated book and complete details of your Rome Study Course in Electricity Including your outfit and employment service offers.

Name.....

I's Action Advertising

ADDING MACHINES

FREE trial marratous new anoung marries, and mattracts, multiplies, divides at utnatically Wishing is \$35 at in claims from a first plant of the hat at a being the first plant of the hat at a being the first plant of the hat at a being the first plant of the hat at a being the first plant of the hat at a being the hat at a being the hat at a being the hat a bei

ACAZININI SERVICAS

ATTACHENT SE SEC SALE O G 26 MOP AND A 26 MOP A

At it is a part of the part of the property of

And H I to all the street and perspays and perspays and Alexandra has at a to be and from Taylor's Alexandra Helicita year. Except S. Frences H. Special display. All houses of Mote. carries M. Sentime Berries, Womater v. W. sh. Sentime Berries, Womater v. W. sh. Sentime Berries. 24 words to be designed by Newspayers advertising the Mote and Mote and Mote and Sentime Senti

ALTIFIER UND MANUSCRIPTS

Principles of the property of

Witchfields stor a promote plant pres a series of the present of t

he first and the first and the

I WANT more present. Comput Pathon, Fried No.

AUTOMOBILES AND ACCESSIONES.

DELIVERT bin ice for Fired Minist T Channel with Inclined mb, mittable for Contractors, Orocerymen and bymers, Three styles, Price 577-50, Write Danse, Francisconiae, Contractors, Contrac

Cat see protect for the burney back if you

The year want a pass look at the 2 per year were thinked bear my to buy a pass of a to the pass of the

appay the mere and the material for a major of security to the pay of the

Print a bright to a bright and William Property and a front of a green part of the bright of the bright and the

I se house all not of h separategy to a house correspondence receive the laser to d a se h the first sight the first an profit as set as less than a set of a second of h se look, [sept 676] array historiages h.

Aero Shop, 3050 Hurlingt Ave., Detroit, Mich.

BOATS AND LAUNCIES

Hand of the North Company of the Com

1 . G D book 4 Cs. The module is the second of the second o

HE SALDE OFFICE SERVICE

WARRINGTON Road address In major From Section 1999. Address "Gravites", 606 Austral National Benk Belling, Washington, D. C.

Rate 30 Conta a Ward. A 187, discount is allowed an all contracts for an consecutive insertions. Advertisements intended for the Mar, 1936 forms should be received by Jan 5th

BUSINESS OPPORTS NIFIES

higher his and the second of the second

the man a ber took in a , how a spirel green and a least a least of the least a least of the lea

N ra s H wen do e o g Hode, Watterston, & t

to TREE. Waterson Burney.

I the get to be rought to be the to be a second of the total the second to be a s

the state of a person of home of the state o

LEARN the collection bustiers. Good meutic quick The Person of S Admir callede. Provided Socializing, Nove-

STUP piodilitat? He surrewful, Operate a tire report from Mayound a 1900 reputs the hope Arman.

The property of the property o

of the series processes from contribut the forms with

t ch. (of more) in agrees is being our of your own.

I set y bour is much Fix one from the Abell,

I will be a read of chant

I will be a long of the agree of 75 W

nech hind mier i messele fremher teiln best net min Z e in Bernelesk pas dittib. d as Tieps P Shanker in

this said a lot " New our advertisement of many the Decise Thornal Company, 4043

Train to be as on the train of the state of

E a new C . I to here making to (---ex a new Providential tests, Additional.

\$36 WHFELE Your Own Custient, Engrance Profile, Pine, Sample 50c. Surdam, P-36746, 11224

to a sight on the property of the second of

BUSINESS SERVICES

TO DEFEND THE RESERVE OF THE PERSON OF THE P

MR. ACTUARTISER And today for a copy of the Quick Action Advertision Base Folder. It contains some really important facts which will prove at two and the popular senses Stoots a Propiler to the Actuary of the two tensions. The Actuary Provides the Actuary of th

CHALK TALKS

I a To T pero se sur p a. en d di Carratara from

DISTRICT MANAGERS AND REPRESENTATIVES

The court of the control of the the position of the court of the control of the court of the cou

DOMAS

the factories by a fixed all proper charge buildings,

RIPERATION AND INSTRUCTION

The state of the s bright Many his

I we do not what extend to some write Carnagio

PRINCIPLE FOR CHARLES AND AND High wise. A per mode multi-management is in morals per on the management of a process of the management of the manageme

to N find which equal to return the high few formula to the second to th

and the a least one of the second of the sec

FOR BOYS

All a mail the to introduce

FOR PAYENTORS

times under at the vertices in a second to a given the first and the second to the vertices in the part of the property of the first and the second to the part of the part of

call such her your patient of haventhin under our flow plate. It rite at more to inventors' Symplectic. If he are such that the property of the particular of the first partic

f f frequenters for each particular time, began blanks, \$1.

SELL your patented or unpatented invention Write my there plant. From Harrier, 64 Control St.

to the time the man a reports to give heep pos-ble code of the cut of a code of the full formation. The Mr may say new a chard part is reasonable to sum-tions for the cut of all other the total months to sum-har a street of their can programmer Assertations, there are the cut of the cut of the code of the code.

FIRE SEES A 5-25 THE SHEET

The property of the property o

FORMULAS

I'm to be been as an Portura Laboratory Formula

FOR SALE

Facer or a 1 a 1 a 1 a no a a hargash M.

or Dani 4 a 2 hour his remainre ract with

the steel a source of search photos 4 E Pattings,

3. The real Pass France

N'R MANNE ACT BY BY LATTER OF THE PARK SING Dump Arrant I see tends magens, down discount & S. S. Markens, Applegate 1979.

About 100,000 people have tried this remarkable hair-growing method. Each had the privilege of getting his money back. Yet when the 30-day trial period expired only 3 out of every 100 asked for a refund. And they got it instantly!

The same square guarantee is open to you. No strings-no loopholes-no alibis no "ifs" or "buts" or "maybes"

if my new method doesn't grow new hair for you in 30 days—I'll send you my check refunding every penny you have paid and the trial will have cost you absolutely NOTHING!

I Guarantee YOU New Hair In 30 Days-Or I Pay All Costs!

By Alois Merks Founder of Famous Marke Institute Fifth Assnue, New York

GRASP this chance. Start now and save yourself from the tragedy of baldness. Let me preve to you-without a cent of risk-that you can grow new hair in 30 days'

An Amezing Contract

No matter how fast your hair is falling out-no matter now little of it is now left -no matter how many treatments you have tried without results, —I absolutely guarantee that my new method will give you new hair in 30 days or the trial costs you nothing.

Why I Make It

ing many years research and from expercence gained in treating thousands of cases of ballness at the Merke Institute, Fifth Avenue, N. Y., that in most cases of loss of hair the roots are not dead but merely dormant

It is useless and a waste of time and money to try and get down to these under-nourished roots with the average tonic or with massages, crude oil, etc., for such measures only treat the surface of the skin

My Method Gets To the ROOTS

But my scientific system involves

the application of entirely new principles in stimblating hair growth. It penetrates below the surface of the scalp and gets right to the cause of most hair troubles—the starving, dormant roots. It provides not only an efficient way of reviving and invigorating these mactive roots but of giving them the outsishment they need to grow hair again. And the fine thing about my a stem is the fact that it is simple and can be used in any home where there is electricity we bout the slightest ducomfort or encountrience,

R. Washington, D &

I have found dur-New Hatr on Beld Spots years the results up to the present are gratify or. In face the entery hald spot is entered with a face greath of hair. W. C., Kennege, Ohio. Can't Say Enough For Iti "Apr giad to say I can see such press change to my hair. It is grown. mg funger and my hair It is present in funger and my head is full of young hair that has made its way through since I have been many Merke Thermocap I can't say crough for it. It will do everything you claim at to do? It. G. Teass.

RESULTS Results Coutlying

"Ten years ago my hair marked fulling I used had a constant's but four years ago I displayed a profect us mooned. I tried a re-chine but without resu a. I day had ever thanks to year treatment I have but a new map of hair one inchilong." Y. H. B., New Y els.

Hele About Cone

'My han has been to an fee the hast to worn and I had hardly my names made on the front of on head But more I at and accor your every New Hair Growing

Results are winderful bly fair has scopped failing just and I can bee may it may be a country or F.D.

"I have used The me cap Treatment for A works and a brush the try of my head has been on ush hald by 5

No Cost If It Fails

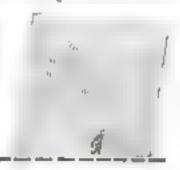
Of course there are a few cases of baldness that nothing in the world can Yet so many hundreds of men and women whose hair was coming out almost by "bandfuls" have seen their

hair grow in again at the a runken posts acquire new life and vitanty that I am willing to let you try my treatment at my risk for 30 days. Then if you are not more town delighted with the new growth of the produced, write me immediately. Tell me my system has not done what I said it would, and the 30-day that won't cost you a cent.

Free Booklet Tells All

The very fact that you have read this announcement shows that you are anxious about the condition of your hair. So why not investigate? Find out for yourself. If you will merely fill in and mail the coupon I will gladly send you without cost or ob-gation a wonderfull, interesting booklet which describes in detail my successful system which is growing new hair for thousands all wer the country. In addition it telu aŭ about my tron-ciaŭ guarantes which

enables you to take my treatment without a printy's risk. Clip and mai the coupon today Allied Merke Institutes, Inc., Dept. 171, 512 Fifth tvenue, New York



Allied Merke Institutes, Inc. Dept. 171, 512 Fifth Avenue, New York City

Please send me without cost or obligation a copy of a sar levels. For New Way to server Ham describing the Metter System

Kame.

Address

Chr

Stere

FOR THE HOME

HIG money in Pensing Colonial Page, quant ing Sarpet, dearth, etc. Blume measures are always bony Lound bow as low as \$4.00 Liberal Pay As-You-Wears terms. Write fortag for free complimit. Uness, Louis Works, 442 Facury St. Bontonie > Y.

GRANT FATHFIL riors works to an itual your own from thirturnions free make good product withing roof friends. Clock works with chimes for old or new right. Write few bull particulars. Clock to Nice own Productive.

10) the man who there to work with trails. Propagar Research Stanchy offers he oppositioned to use he interpretate group details of the country of the following sets in the following sets in the following residence of the following table, No. 5 h. seen t. sharet, Mo. 2, Tea. Wager. No. 1. Workshop Beach N. 17 Coder and Major any (Test. No. 4. the Table Ratio Set. No. 4. the Table Ratio Research, No. 4. Research Sets of the Sets of the Ratio Sets of the No. 4. Research Sets of the S

HILE WASHIN

HILVER VIJ Mar on brette of the Easter is food granded granded Places from West Marine Warten, Linpelalist fight up a fin

MR JURES HE National State Parabilished New York Brush Mahular start resistent the new set of them in all landaries to set their excessive line of Santiary Twisted in Ware brushes. We pay sargue communicate than any other Brush I manufor he came by Marie samedia six for our propose has a Ware Cirip sanitary Brush Lorg. (4) our propose into Will

MIN wishing to color divisation appears not service as resolutions parties we take write had Ranbons Kachadas.

WANTED Representation in every lactory in the United Starts Supular Science Monthly 250 Fearth Ave. New York

FARN 310 to 670 weekly mailing the store at home with and trul burnous, 250 cars, mercuso, 4733 2 d. A Hington, Abrille to

HILL WASTED INSTRUCTION

Half Carriers B of Sales M. a State being Mall Carriers B of Sales post stone a State Sales Sales Branklin Indiana Local B & Branklin Branklin Branklin Branklin Branklin

Defret Tived Larn life Stoner Rawlind open-tually Travel Pase in the work hypermace un-percentary With Courts Wagner, former Covertament, Delse we MAP Brandway N. Y.

FIREMEN Brancisco, Haggangemen Computer cut finia parkeys colores & 60 6.00 Fajerteines shiftende pary 850 ftg. by ay Property From 96 Lengto, 30

HOW TO EXTERT VO

PICTH members respective and designed in such that it was a lie of members of the six processes of the six process

INCORPORATIONS

Market St., Wilmington, Hel. (Established 1906.)

FREIAWAHR Superpurator Charteret Frent Smalli Berling markets

SPORMATION

[] 1870 worth information on him bigh Labority Burrous 50 Lake the other Mass

Marron St. Lake We never Shows

All All PRITTERS And tested for a copy of the Spaich Action Advertising Name Paster. I copy of the same residence in process as sever of and specialists to you it also esta there has a family frequency from the Propagate Peterses. Mostly Profit only I have a like to higher weights you? Address some nature. Manhapper Cleanified Advertising, Popular Science Monthly 130 Popular Research Accept, New York.

INSECTS WANTED

WITE and reported depressor formatter and built as recovering that existent linear of a large high-levely of histories desired linear or in h 2 to 27 each military and survivious or in the 2 to 27 each military and survivious with any final course, price of Persons and Persons and

INVENTIONS FOR SALE

TWII Inventions his aide on weaptweeking tool John Banks, 2 0 thing Convent Plane long saland N. Y.

LABORATORY AND CHEMICAL SERVICES.

GUARANTEPD Reliable Portugues Trute Secretar CDARANTERD Reliable Portunite Timbs describe the reliable to the personal like Manufacturing Processes for all lines detailed which has directions, inside commercial in formation. Living buy of the end you may applicable Living time. The mental has been allest the most function of the amount at the personal and the function of the personal ways appropriate the personal time of the personal ways appropriate formation that the temperature of the personal ways appropriate formation that the personal ways appropriate formation of the personal products.

to Employ to

Y It chemical problem solves and working process fromtelest for \$5 to \$1.00 ms W street an Richards. Committee for \$5 to Ber 25th Boston \$5 an

MFIT procede to hell broom, gods area office alliand Figure 1: met stat bifficacea prices from 6' 00' Name (ex-Brest Electric Farmages 4' N Wests 40' 4 bit ogs st

LANGUAGES.

WORLD'S RONDY System Manhetter Study Symposium. Printers 21 (M. Charese French, Spanish Laurungen, 6 Wom 40th, New York

LETTER SPECIALISTS

I W REFE let any spident book etc. comes to informate for manufacturers, mail unter ten end into expenses with for details. I. Taylor Box Sas, Frequet III.

1.15TS

NAMES, postments, 1908. Den Steam 35 West 21st

NE ADVERTISER Ask today for a copy of the Tiguich Advertising Rate Folder. It common name really important finds which will prove interesting and valuable to you It has sells. How You as I as Popular Science Monthly Frod noty. I on a like in know wouldn't you? Manager Camifort Advertising Popular Besonce Monthly 250 Furth Avenue. New York.

MACHINE TODAS

No 40 He at II Am Typinder stander Find 60 no 3 Cin. may a strong machine \$2.5 (0) 24" Handy Shaper \$3, 10" A as Bradinia Play no 2 to 22% Only Press 5 10, 24" Woodw ster Planer \$1" 5 (0) 26 Band way 55 10 Terms a sur on single marker of complete shape a complete has of markinery and supplier. On analy Stachmery & Supply Co. 255 E. Pearl M., Ch. 1865 E. Pearl M.,

MAGIC TRICKS

BE a magician give above, turn natury faralogue 20 cross from Magica, to from an athlese Risk a Fernier of Jeffe man most se h.

MAIL DROFK BUSINESS.

Elizad evice a year home eventude I have be blight twice that stamper application for a position of the second of

13 Vol No Y making phrase the order supply source.

10e a return to may bingers are a repy of the Questor of the part of the Control of the properties to the part of the properties to the part of the properties to the part of the properties to post to the properties to post to the part of the properties to post to the properties of the part of the properties of the part of th

MANUFACTURING

PRYFIGHT I have and manufacturing our me-ricity Administrating line 37 mm engages using The h A h line & superalty to, 30th Jam 44, Checkhat come legs t

A 23 I is trough one were will have you from making framing may take in to be readily and and and equipment W to be P quar from see I struct the Frame have. How York City for set of tested and approved products.

WANTED into manufacturing and experimental work for me guaranteed to be cheatent to America Send income or manufactor for questalisms. Mele's Mig. Co. Matter. A. New Haven. Cong.

MANUPALTURING, Models, Dans, Stamping, Braus of thousands Rases of Street Springers, present to yet an

MISCULLANDOUS

P. H. S. D. and L. Sell. To Lo. and S. a. thora T. p. pers. An obtain to L. D. A. Ser. Market Ser. L. pers. An indicate sequent there is a resolution of the second to the

St No Har Translate trader base I and A. Cambrida Johnson Land Dist. Mathematic bless short \$4 to Mathematic opine messes. District in regard and in Mathematical

MODELS AND MODEL SUPPLIES

101 Ct T & 1 & p haven it because all met a Markets of the Viahers | first Chemphels general Mark to along 1 to quantum in

Will makin with his most his feet in western about sequent historial so it and a Tria receptor starts of brigan graph and finally important from the calgingue. The discrete historial fluorests, over these interests are shorter page from self-times. Moster much as were an elected fits for these years Objects and the angular hardwise its second of a linear page of the line years Objects and the angular hardwise its second of a linear page of the li

MOTORCYCLES BUCYCLES SUPPLIES

y hip part or had be through the common the tracking the second of the common tracking the common tracking the common too tracking the part of the common too tracking the part of the common too tracking the part of the common tracking the common

EH N Thur a hirycle booter artachosett until you get our careferen and privat. Phan hitt in Lingt 6, Calmburg Karena

Mill Acts FRT APH Are orlay for a copy of the "Charle Acts at a creating Bar's being 11 unitable more very properties 1 to think we proper interesting and on arite to prop I also still Stow has an time Pripater & Store Monthly Profits in I and he to hoose, breather to Standard Landbert to comp Properties to Standard Landbert to come Properties to the Standard Reports to New York

MOTORS, ENGINES AND MACHINERY

I fright this is the second for each position of the property country phase are described for a first think the second form a first make at first the first three affections make at first three fight and power parameters at first three fight and power parameters a first first three fight that proved parameters a first first three fight and proved parameters affect the make parameters and first three fight that the first three makes and generations are being up in the class of facts the area Disserting to be coming of the class of facts the area Disserting the facts of the area of the class of the

MY SEC AL

(Januarula a SAN DER VIETA With the sale get 'Free Postiers Server & Balos N

DETICAL COOPS

\$167.55 c.T.53 eyes Bloods BON Darries, alex or reconstr-Exercised from Deniver Crysler

OFFICE DEVICES

the parties of the control of the parties of the pa

PATENT ATTORNEYS

part NTP Time consist in appropriate for partition to the delay a product our your real front that is a partition of the partition form. Note that the following form the partition of the partit charge the blumms of the bow to proceed Communication there were the process of t

PATENT Sense as one of the oldest patent from the America we give accordent at lowest consistent charge a genuine noise for REAL TS embedded by six many well-known Patents of extraordinary taken. Book PATENT-REAL free Large 4 Large 648 F M. Washington, D. C. Established 1980

PATENT ATTURNEYS

PATENTA Before daximised an invention the present of haven be made but the manufacture of the manufacture of the manufacture of the manufacture of the transfer of the invention for the invention for the invention and about one can Court broad manufacture to invention a bit of the continuous fractions of the Court of the manufacture of the continuous range in the present of the continuous range in the present of the continuous particular them to be present of the continuous range in the continuous range in

with the mechanical movement is and little or one and free days because of the Landbert Patcht Attorney 2 free date request M. Pack there, New York

PATENTE, trade marks, topy table. From pt per-impal reliable service sor Mr now active persons where the terms Pook from Addition 2. G Siggers, top 1 C Substitute Washinston F 1

PATKNIS PATENTS I because free James tristences Punts results. Prompthess assured Walson & Coleman. Patent Lawyer, 544 (Street Westing on, 12)

INVENTORS Goule free up request it we valuable information and advise for no who have original strain or improvements. Frank Lasterman, hogistering Alternay and Engineer Woodworth Bing 1714 New York

PATENT Book From Charles W Levett, Patent Attorney Lynn Muss.

TWEATHER THE POSSES OF HE SHOULD THE POSSESS OF THE PARTIES OF THE

MIT 1.1 Not spent attainedly for bleast. Hightress how wanted. Parent worth and great. Not to treat for free back toda have we be producted yourself, have a revent, bleas trapted have we be you started. American Judge-trees for 50 keeps liddy. Washington, 42-4

PATE WIR. Fracto Manha at comparing Ton yours represente chamming applications in Patent office Landauguarum des des foreign Region Patent Attorney 100 Namen Street New York

ENTABLISHEED 1964, M in S. Sterens I oppose Free Stadle Senta Trace Stadle, upposelts, Officer Stowardsock Block, Charge, Barreter Building Westing

1994 to the recent of form As delice of Laboration to be exceed and without the high fee action for the formation from Laboration of and Allwine Requirement is a society of the ed Platon and Canada, Japaner 1982 to the control of t

PATER & Properties Track Starks Registered A comprehensive care intend primaryla activities for the pro-ter det stat der et primat at treat treat Preliminaryla, to the chart if a state the pro-ter des states for attent at treat treat thought in a special to the contract of the start thought in a special to the start for a start the start that the start is a special washington in Course to the start that the start the start that the start the start that the start th

PATENTH All fee in testatements have personal lates I ship I Forter Bastons of D C

At Nic. 4) At the M. Central Body it anticogram 15.
I have Austral New Anich Ther rivel I special bombled and different Research tracks gravits

PATENTE Security Body history for a strict inference
for participation becomed from the extension of the security in become a first secret for each
A security and strict and strict and the security for each
A security in a distance and the security for each
A security in a distance and the security for each
A security in . . .

PATENTS FOR NAME

Hart I'm enter them of du distance thirtypens to Table Two is implete I been in one of I beginn have as a Prosper A desirable data be public from that he elektron II and obstery, have being all

PROTINGBAPHY AND SUPPLIES

HAVE you a cometa? We to it free someth of our lite translate. Shorting how to bake better plantim and early content. Assents a Photography 227 Lamers House, Reston, 17 Manuschine is

SETATI OF PROPERTY OF STATE OF

Milk Alab PRF 144 Ash today for a copy of the Court he on Add research Role Indice. I contained more that a term of the Property of the Plantage Statement of the Property of

PF 17 m dt 571 5 hande thum Shetelseaus Head Photos e asters Breu Levin T48 Heistan, Lamelah 165

(A) A T I fain Prints True Offer Your cash for the Injer and the pied of the F H B of any phens the pt. Y. 1500 Foreign Ave. Charleson,

PRINTING AND ENGRAVING

1 '60' Let este in Invelopes Arie 5 if prelimid 8. a Sun plea Free Ariserra Fram, 60 Houghton

I to If t raise Pring on the 20th Hapmyserpill Bond for Brade h 500 flat in 155, while will be shown one thousand, its at The Courtest Company see the subtant

M N13 mak he bowness fertile sent free I aroush scheme adv N13

Not gampets I a per \$3.50 commercia sine for business one Name togethers and notificing Properties in of 10 25tg Dottact repression From P. H. Kenstall Limits N. Y.

DESTITUTE Principle for from 5 anely. Write on about our printing breeds and you will have former. Effects with 4 amounts of Sea h Leasthout Freed Children.

the well has for newspapers Figh N \$25 week - space are well too for newspaper specific by the select third commany operation of the select third select third at the select third select the select third select the select third s

MAZORS AND BLADES

1 com Sire a 178 from one most blade storred 25c Burliot Buy 1978, San Prateriota



SALESMEN AND AGENTS WANTED

A Figure Make a under an house and Question as an activation in the partiage from Campitor Mily on Toron 467 Asserterian N 3

H. W. B. v. a. y elizating in cross. platfor a 1 re-figure of metal start for given change-barries, independent for the for wheat P. Shoras Ladershopford, It has been de-tray blook back.

to proper write the few acategors. But Maries there is not been a reputable to a super more required. We are no sweekly and tensors. Madman history, 500 broad we

Mr J. of a race of the state of

As PATES to an a Talegroup in his every post a selection with an affice group lay post deviated a reason from H. Marin Company Tribums Summing, How York

Figure 197 Wold Repairs large punctures without someout or hoot. Louis a profit store day fait. Writing to Pear to mappe Tours are given fair. Committee that he managed to the committee of the large to the committee of the comm

N'7) manufe and feat a led \$ 2 were built gold phings for the sales \$ 30 charge \$ 4 make \$ 3 for particular and the particular

Will start person man membratishin was one on the or the property of the propert

HP pay \$48 a week for tab outs and as evenue to introduce out temp and War of refer Bosto house, Company Imple 448 to prove halfs Will

It is not free to the sale or a price part young and proved any Price of the Continue to the Price Price of the Price of t

As the first proper to the post of the post of the com-tions in a facility that here beings the part of the part two statements a manufacts to the formation

Fig. 1 was date a first through the properties to the term of the

the set of the set of

to cold thereon the new way. I so the Tourself Arrivante Washer I no or to teleph in the Francis to the Santa Sant

No. of Post FEF Shorting At the a Manager Markets and the markets of the market of the

the party of the section and the past design rested from pages, the past of the page of th

Arguages Bin - 2000 a manh Controlle gold by replaced the state of the

to pit the plant for special property of the p

POLICET POLICE, to a series of marries of facts of the series of the ser Both Inc.

MER. ADVERTIBLE has been for a suppy of the Poster for a suppy of the

BIO STATES at a major transport of and and and an armount for the state of the stat

A statem businesseller from Histories II in for the part of a second or for the part of th

to be the second of the second Manager

The state of the s

property was because the separate of the State of the daily the electronic former of properties. From the case Target 14, 200 Decision Character States

A profite descrip mounts for eather no server of bearings and freely provide rice without requirement a to be rather to be a first provide the profit of the server of of the

SALESHEN AND AGENTS WANTED

reduce A state that I was use there are chappened as a minute pass of the area of the pass Agent House of Fig. 5 Property (sept. 1 months) was a sept. 5 p. 1 con cont. 5 p. 1 con con

Company of the party of the law of the party of the party

the second secon

A THE MAN TO SERVICE OF THE PART OF THE PROPERTY OF THE PART OF TH

description of the form of the first property of the first property of the pro

the state of the second of the section " went on the section the story I to be at Pers bank of the or of the best of the best best of the best of the best best of the best of

The first part of the property N and T & Think them With a Suppose

to \$ 10 cm ore if he cannot so all to be a second of your sort.

Done - 1 or of the contract o

As no a life ofth temphrase girl but with Amptering secret and Living Coal time and temper dever \$25 do 9 flyengers for the life desired. Howeverland, Dogs. 5-0. No. 10 form.

Fund of the State of Spart a root to over broken v. Etter to old mothers on the parties from the agenda. Laybeanage Co. Et., Ph. of Material Verbing Sphillermode. Verby up to \$33 on

The first and the same of the pronoun tree true t gener

FRI HAT THE Tears has I were per A berry

The property of the second sec Linerating Pro Propalar Privace Municipal

To be have at the Ports

I By D. B. V. par Prop. Propleton Under them

provide I Veryonia in Proprioring Tracks derived Madeing

manyor appellants. (Atalog See C Thanky Co Washington, D.)

SALESMAN AND AGENTS WANTED

Wall's to Represent a see in very honory in the arted mater. Popular frequent Managhry 2.6 Franch

got with Prop. h. I they was Propose to a model types than wit up that was said to be the said t

A to P bloady & a day five age double by thready Abanca of others with broken a page type once are wash plant armed & taketh privace, a leak Nexad har French to be reflect to the Nexadan, A might a specification has sell of their

Note that or here for extens and terrally the Printer Wart full or sparty me. A sea of request his this wart work and the best of the said of the best of the said of the said

the part of the private and the part of th

WANTED Reports at on his year fact of he the Called will be Proposed Stronger benefity 256 Proofile And New York

Any Deput hery

| Compact | Compact

Y with

The property of the property o

At 1 % 2 william of the state o As I had a wife was for others. After freing million

per to appropriate houseons making chapped places

HET I have be do not should be made with property of the harden may be a control of the position with property of the harden may be at 10 to 10

the term of the property of th

No. 10 to 10

be a second of the second of t A me I along

The state of the s

The state of the second state of the second state of the second s

The state of the s

They Thought I Was Bluffing



~When I Told Them I Learned Music Without a Teacher

YOU could have heard a pin drop in the room! I had just finished playing Rubinstein's "Melody in F." My friends were actually dumblounded—they couldn't believe their ears. At last I was the center of attraction instead of a mere enlooked. It was just like a dream come true!

"Why, you didn't know a single thing about music not so long ago, Bob."—"How in the world did you ever do it?" A note of half envy, half admiration unconsciously crept into their voices after they had recovered from the unexpected surprise which I had just furnished. "Yes," said Jim, "what sort of a trick have you played on us—I thought you weren't musically inclined?" "Oh, he's been taking lemons for years and has kept it a secret"—followed Betty and Sue in rapid-fire succession, "You can't fool us though, you never learned to play that well without a teacher."

'Well, you're all wrong—every one of you," I replied, chuckling with glee. "I'll admit that a short time ago I didn't know one note of music from another. And as far as special talent goes—well. I never had any. And although I had always.

longed to be able to play the plane it was more or less of an empty dream. For I just couldn't stand the thought of learning music from a teacher and going through a lot of monotonous scales and exercises. It just went uga not my grain.

"So I've just contented myself with sitting around envying others who could play—watching them have all the fun. Until one night last March I was reading a popular magazine and suddenly an announcement

caught my eye. It told of a new easy method of quality learning music right in your own home—and without a teacher. At hest I laughed like you follow, I thought that so h a thing was a joke bomeliow or other I didn't be seve it was possible to learn music by mad. But that announcement set me wondering by I decided that the only nearthly thing to do was to investigate. And—well, you know the rest

From the very beginning I was enthusiastic about my wonderful course in music
hack new lesson was better and canter
than the last. Everything about them was
so simple that a child of eight could understand it. It was great fun—actually as
fascinating as learning a new game. And
I always played real notes and catchy
tunes. No tricks, puzzles or makeshifts
of any kind.

Now I can play any piece of musicwhether it's a ballad, jazz or classical number. And I never have to refuse when I'm called upon to entertain. No more lovely nights for one. Now my life is just a joyous round of gay parties and admiring friends.

Pick Your Instrument

Flane 'Celle Harmony and Composition Sight Singing Druens and Trapa Banjo Unulale Tenor Guitar Benjo Hawailan Sexophone Steel Guitar Mandatin Plecelo Harp Clarimet Flute Trambon Voice and Speech Culture Automatic Finger Control Plane According

Play Any Instrument

You, too, the precise the series of the an analysis of the analysis of the account of the series of the account of the series of

No matter whether you are a mere beginner or already a good perlyrimer you will be interested in learning about this new and wonderful method.

Send for Our Free Booklet And Demonstration Lesson

In order to make it clear to you -- to show you pust how and why it gets results twice as fast as any old-time method we will send to you upon request an interesting feer his kiet and a valuable demonst also become that will make clear the method by which so many thousands have learned. The method is the same for all instruments.

If you are in except about want up to play your favorite estrained of you really do want to gate the professory in make that will add to your happiness, hereard via popularity and open the way to greater income task at once for the free bunklet and demandita on lesson. Getting them will cost you not be a und place you under no the gation. Right now we are making a Special Offer to a limited number of new

Now before it's too tale to gain its benefits with and mail the convenent coupon. Instruments unpplied when needed cash or credit 1. S School of Music, at Britaney k



U. S. SCHOOL OF MUSIC, Il Brunswick Bidg., New York City,

Please send me your free book, "Music Leasons on Your Own Home," with orraduct a by Dr. Frank franc Demicostrate a Lesten and particulars of your Special Offer. I am interested in the following course.

Have you above justingment?

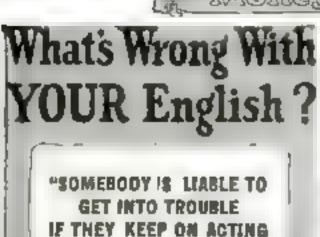
Vame

Lity

Please write placety,

Address

City ,...,. State ..





Stop Making Mistakes

They may offend others as much as these offend you

I P some one you met for the first I me made the maraken in Englis above what would you think of hom? Would be instant your respect? Would you be inclined to make a friend of hom? Would you gaze to introduce him to others as a close friend of yours?

These errors are easy for you to see. however you make other motalies, which diend other per de no much no these would dend you How do y a know that y it is not mis if he received terts h wor a me you always sate you be the though you say and we to are grammatically perfect? To you bry may seem correct, but others may know they are wrong.

Unfortunately people will not correct you when you make motaken; all they do is to make a mental reservation about you. He is amount and uncultured "they think. So you really have no way of felling when your English offends others.

Book on English and 16-Minute Test

Sherwin Cody perhaps the interment tracket of English in the country has let and a sample 15-in but English , out which y a can take it y at own hour. This test with the area is which will who he sent tells a new outs the a sale where you stand You can discover at a giance when dry a make even at ght errors. Give you self this test. If you are efficient a part of give you greater or addence if you are referent you mure y want to know it so that you can correct your mistakes.

Mr. Cody a remarkable new invention the 100% Belf i arrecting Method has a coast improved be Enginh of more than 41 000 pc ple. No useling Engigh of more than 41 000 pe ple. No useline rules, no her use copying, no her study. Only 15 imputes a day rendered his heart by creating the HAB T of doing street Fig. th. Nothing ake Mr. Cody's method has ever been used before.

You do not want others to judge you unfairly. Write today for his test at is feer. We will see glad y mad you may new free book. How to Speak and Write Masterly English. Merely mad the coupon or a postal card.

Sherwin Cody School of English Rochester, N. Y. 181 Searle Building

Sherwin Cody School of English 141 Searle Building, Rochester, N. Y.

Please send me your Free Book How to Sprak and Write Musterly English," and also Mr. Undy a 15-minute Test in English.

| Name. | | Ŧ | , | 4 | | | | | | - | 4 1 | - | | + | h | ٠ |
|---------|----|---|------|---|------|-----|-----|----|------|---|-----|---|---|---|-------|---|
| Address | ١, | | | | | 4 1 | 141 | | +4 | | ++ | | | , | - | |
| City | | | | | | 4 | 1 + | .2 | n fe | | | | _ | | | |

SALESMEN AND AGENTS WANTED

SARESMEN AND AGENTS WANTED

MANY 6 On Breaty to Equat value well what the public wants inog distance radio receiving agas. Two main weekly pays 3100 profer. No big thirstiness. So expressing Rharge of Colorado made \$655 in one though Representatives was east once. This gian is excepting the cranity what taking better your county is gone. Outsite in 1254 August the Tistato.

All Wall made a consister with \$2.5 miles. At the receive of the past of except and first and distantances of memory terms sed. Trapelies a third of examination of memory terms sed. Trapelies a third was fault to far to the large free against anything How takes free agains anything. How that is not a contract to the first third and the far any far the professors of fact and the many for the pays of the first third of the far and pays the first third contract and far anything any male pillows. I comply be privated. A trapelies are the far on first of the an agreey offer and convenient one white I in the graphs are the far on first of the an agreey offer and convenient one white I in the graphs that a past y offer and convenient one page.

All? you all at heavy free our adventionment on page.

ARP you old at heavy feet our advertisement on page 130 of the tense. The Electro Thermal Company 4063 Stain, electronic Chan.

44 STEENS on the since Wonderful Vapor Humbilder All auton advectorables over a feet \$120 When the

At 5 Novel No competitions will be appearanced to estady only \$1.05. Pay daily. We despite entirely break some \$0.00 E25.00 daily may True-Yuthetic Co.E.W. Inc. 5.8.W. A. area 54. Chimado.

At FNTN make \$ 00 week placing advertising hear state with glass front. Every dealer wants one he for true plan. Drahm help, Co., Dopt. P. Milwatelier, Wie

STAMMERUNG.

BUTTER TETERING and st minering cured at home instructive translet from W. Her McDennedt, 10 Az ala I May published avenue. Chin at 10

STAMPS AND COINS

Picchia Prive Asta of 1500 barrates and Raw set houses. Propos Manne Co Manne Pa (VITPI) STATES and Foreign money Medala. Catalogue and Villa Bill, Ide. Alexie Meagaile, Colorada Springs, colorado.

J S Aur at 20 gomes to Appeter I Applicants sending Sc Posch y Sub-P atameda, I system them PTANIPS of All of the city, A money Lists for P if guarant Stamp to Treesto thing

Fired Delum.

for a come Large Spring belling a single of rates for min free at a logue quoting prices was for custa, ten rents. William Hembell, 1911) Tremont Street, flooton, Mass.

CALIFYR STA gold by stee, 270 Mg stee, the White Frot and c Interior, 10s Norman Schultz, Colorada Springs, otorado

STANICS for him str 2s Albam (500 Bluries hong) be. Ha on St. Ham to be there is a street of special toute, st. life thorough Chinocolou and Ida different, Society, Bluries, etc., 10s himself, 452) forthere, it is beat him.

Fr. R.F. N. and F. H. Bandiget for all different to appropriate buildings at the W. El. Ph. h. Principle. a "forming."

to a fit wanted to at man to to every go out big firetign form from 35c for fire e-to-tion. Calculator to thems Reprise blads

TAPEWRITTERS USD SUPPLIES

PYPPWEITTEN all to are Instead to the S out theretare would feet filler used to theme Steady Typeweiter the \$17 West 1. Street New York, 5 Y.

DEFFECTIVES madely exceptions Typeshape in-principal Learning in the Control of Typeshape in Y

WANTED Representatives to every factory in the sized States Propular Science Monthly 250 Pourth to New York

\$100 in Cash Prizes

For the best letter of 150 words or less answering the question-"What advertisement in the "Money Making Opportunities" Section interests you most-and why? First read every advertisement in the "Money Making Opportunities" Section on pages 120 to 150. Pick out the one that interests you most and write a letternot exceeding 150 words—telling us why you find the advertisement you have selected the most interesting

See page 5 for last month's perze winning letters and additional information about this contest.



With any about out method of instruction from will in the born to set may illustrate in the born to set may illustrate in the set of the born to the property of the born to the born to the property of the born to the born to the property of the born to the b

Picture and Phonograph Record

Method Easy We don't depend upon principle of lease on only for you age of agreement the formation plan is a serie of a miner play age of agreement the group trailly religiously of seasons from our since the result of age and perference from our since the your train hands one enables give to father to bein playing just an if her were us only in temps of your poor less lesses from.

Rush Coupon—Send Ne Manay

So post fee are we that you will become one of our statepts we will small one to lead still a set, our free frames. After one is not free oil took which his one passific a state of course White less your one beauting you free tenant today.

HAWAIIAN STEDIO No HIL of New York Academy of S title 300 Fifth Assense, New York, N. Y.

Please rush post free book. How to Learn Hewship Farts and cay first leaves, the process a git Have an Content for me. This obligates me in no way WHALEPER.

| - 10 | ٠. | - | ж. | | | | | |
|------|----|-------|----|---|---|--|--|--|
| 100 | ы | | | - | - | | | |
| | | | | _ | | | | |
| | | | | | | | | |

Address

City State.

Why does it r m to as & all men pan a restain mid to uke? Are you a vu-

min it use? Are you a vu
1 m? W , does it cause wrinten, aching feet back
and feet trequent rightly risings? Amazing book
we en by a well knows American Selection answers
all these questions and to be or a wathderful new
method that has already a ven reflet to more than
10,000 mann—restored the prostate glant to his
proper functioning without the use of drugs, electhicky or respons. For a 1 mitted time you can get a
copy of this book, free by simply writing a request
to the Electro Thermal Co., 4083 Main Street,
Stanbaswills, Ohia, the materia that is distributing this
hast for the addition in limited. (Western office, Dept. 10-11,
111 Van Naya Eldg., Les Angeles, Calif.)

Be a RADIO **EXPERT**

a week in Radio most fascinating work on earth



Train At Home For A Big-Pay RADIO JOB

Learn Quickly And Easily t Home s Practical

Covernment Spending Millions on Radio

14 S. Conversion to now species with llean developing many Rocks. For Parlimenter General Haps said The table the begand part of the function of the poster service will be played by Rocks. Photos process profing out they dispute at Arthuston, arrest to remain and function of the dispute of the function of the functio

Sand Coupen New

Get out of the low pay for get into the most faceinsting accion his pay prefequent an earth. Free Noch rib you have. At I AT ONUX -SEND POR BOOK TUDAY

Radio today is urgently in need of trained men. Radio 4 xperts. Astonishing opportunities—thousands of them have been opened up by enormous strides of the Radio Industry. That's why it's easy to make big money in Radio-\$50 to \$250 a week. Here's a field that

a teeming with opportunities and econi for expanseen -a brand-new, wide-awake, and uncrowded industry. If you re earning a penny less than \$50 a week, clip coupon now for Free Book and proof

Your Satisfaction Guaranteed

Marter Radio Engineers mill show in from an qualify such y and candy as boster for Bada, a fine at heater for Karia, a fine force of the party for se of the party of upon templetons of the during force of the during force of the during the following table all the resources of Mp total Marko force that the total the following the following

Age or Lock of Experience No Drawback

You don't need experience before until of the entropy of common actuallar in enough. Our traced, peaching matter matter make trace, (so clear and must be most pacual thing on earth.

passas Course Thet "Fays For Steel!"

Space time excelling new endered a Radia mere ng peta naveymbers ip kadlayd In every neaght-orbord three are ecosed of toler pro-can harm your hand to in an heart of to after autitor. Built at the class of your Math at the start of your starter we give you type it is meety making lements which teach you how to do the work there have to get to only our practical plant you can make your course pay its save way while you're studying.

Get All The Forts At Once

Artestishing Incts on the macricon are industry of golden rewards. Radio-the fastist moving, live wire line. Free Book pans all the facts before you. No athlestica. Send resepond ntiligation. for it perm

Days, ATS, Washington

Invergements Cliver With Course

Receiving sets, from simplest kind to thourand or le receiver, ine used with at extra charantes are used to der notes that a FD Obs. H to Rt Many other big features for amoved time only

Get This Book

"Sich Rewards in Re--mount amaging hook concerning fluidle over written wi be eems to your prompttly when h is send ALT NIM



What Others Have Done

Why go glong at \$15 or \$25 or \$25 a week, when thoroughly contred Rodlo Esperia earn bunded or more in the same als days what his training has diese or hus diesla d'others it can before ou send

N.R.I. TRAINED MEN ARE SUCCEEDING BIG



Operates WMAQ

"Accepted a position with Chicago Bally News Station WM VO My produce practical videocoled thanks to your fine smiles. Kelvik Kimball, Chicago III.



Gote Big Job

"Just heen made Sales anager of this Hadio vis Manager of Com a big miss on (as Reger I did not take course games R & Jones Bay City Mich.



property in

ne (Mail in procedur year Thanks a mil-







MATIONAL RADIO INSTITUTE. Dept. AT 8, Washington, D. C.

Withou obligation one in any way send your Free Book 2 of Remarks a Radio offer off inferenceing do your crastical bossessed, Radio course

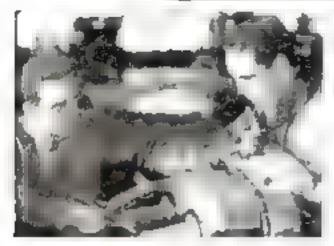
Name

Address

State as a

ARGEST RADIO SCHOOL IN THE WORLD

ORIGINATORS OF RADIO HOME-STUDY TRAINING-



Big Salaries Paid Automobile Experts

Fastest growing industry in U. S. A. offers unusual opportunities to trained men

*HE automobile industry is one of the biggest and futes growing industries in the United States, There are more han 18 300,000 cars regulated in this country and the number is increasing every day

The best way to prepare for success in the auto-mobile field is a rudy, and there is no better way to do this than brough a home study course with the International Contraposalence Schools.

We say this because many of the leading figures in the agreemble world today are bearing represented the agreemble world today are better 1. t. 5 and other free of the control bloom of the Packago Motor Car Co. Walter P. Chryster President of the Chamber Motor Carporation E. V. Eddie Buckenbacker Heam Walter Chief Engeneri of the Chamber Motor Car Co. J. V. Whi oeck, President of the Cereband Automobile Co. and other men officer y as farmers.

Just mark and mall the couton and well send you internation about the E.C. N. Automobile Courses or may other course to which you are interested.

INTERNATIONAL CORRESPONDENCE SCHOOLS Bar 7675 D. Carunted, Punte.

Oldest and invest or repundance retails to the world Without roat or abligation on my part, please tall me how I can upon 'y for the posterion or in the authors defer-which I have one had an X

Campleta Antomobile Course Automobile Electric Louisment.

Bleefried Engineering Abeliance | Engineer |

Abelia

BUSINESS TRAINING COURSES

Numbers Management

Isquete al Management

Persone degler stadd

Tall: Management

Indicat Lag

Isque ng mp Baphing Law

Armonancy orboting Law

Armonancy orboting Law

Armonancy orboting Law

Armonancy orboting Law

Armonancy orboting

Parks Received

Plants Received

Plants Received

Plants Received

Complete See Engine
George

Architect

a beseta hisperenta

beseta eriora estimana

ferior em ligitura

feriora em Employer

liented e de linguage

de roland Englose

de roland Englose

Astronoments p
Advers the g
Marter the temp
Whom the b Letter for
Partners for b Letter for
Partners for b Letter for
Partners for b
Martner the there
Martners the there
Martners the there D. h. Schund Subjects Billustrating

Name

Cib

If you reade in Manuda and this evapor to the Interna-zional Co-respondence dichesta Constium, Limited, Manuage

State



Easy to Draw Cartoons When Shows in the HIGHT WAY

Some of the circumst corresponds and country artists because how to draw in their pare time by following Cartomaist Kanna' Simple and Easy to Learn Method and are now MAKING GOOD MINEY. Send one of your drawings, and let Mr. Evens are it was bury strike and receive the Portfalia of Cartomas and full details about the course. It is not aspective.

THE W. L. EVANS SCHOOL OF CARTOONING Riff London Smillion.

Edison, at 79, Still Stalks Nature's Secrets

(Continued from page 15)

"Yes. It is rapidly becoming universal and replacing the old type lead battery." "Which of your inventions are you

completing or perfecting?" "Phonograph, batteries."

Again we note the economical omission of "and."

Some one told me that the phonograph improvement relates to a method of automatic manufacture of the disks for records. And it is said the batteries are to be adapted for use with self starters for automobiles. This will be almost a revolutionary improvement. The sikuline storage cell lives forever compared with lead-sulphuric acid, but at present it lacks the immediate "kick" needed for a self starter.

"I WAS working on the battery to make it a self starter," said an old employee whom we may call Joe. "Told Mr. Edison it wouldn't work. He came back at me pretty strong. 'Do you understand the theory of electricity, including its mathematics?' 'No, I don't,' said I. 'Only the practical part that I have to do with." 'Well,' said he, 'you report a hig voltage drop. Don't you know the amperes rise when the volts drop, so there is the same wattage? Don't you know that amperes multiplied by volta equal watta? So what a the trouble?"

If I had been in Joe's place I should have wilted-taken my hat and alipped out of the laboratory as quietly as possible. Jos is a tough guy. He stood by what he knew. He dared remand the half-parent of electricity that wattage is not everything; voltage in pressure and is needed to do a job quick. There was too much internal resistance. More volts wanted. Thereupon Edmon scratched his head—a good sign for Joe—and walked

I believe the moral of this story is not that Homer nods, but that we should stick to what we know until the cows come home.

To resume that interview, I asked. "On what new lines of research are you now engaged?"

'Many, Wait until I've caught the

My guess is that the biggest fish is a new automobile battery that would last 10 years instead of two. The saving to America on that item would be more than a hundred multon dollars a year. And the nickel-iron-alkaline battery gives out no explosive of injurious fumes.

"IF YOU were starting your career now, would you map a different course from that you have followed?"

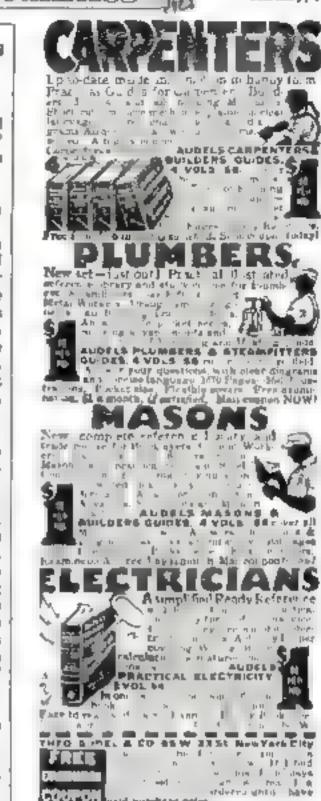
"No," was the placed reply to an admittedly foolish question.

"What inventions does the world most need to-day?"

"The world doesn't need more just now until general intelligence has increased so men can be had to operate what we have."

Edison was a bit tart in the last answer and seemingly contradictory, too,

(Contented on tear 133)





CARPCHTERS PLUMBERS OLUCE -- 14 - SLECTHICIANS

Const. paid purchase price.

Address.....

Legers to magnet all trials of game, their and that tan-fore make raps, and to your name borne during your space clearing and in your name borne during your space store. The an interesting and stry to inderstand, Great sport and into of fun. Hig manay for your space time,

Mount Your Own Specimens

Developed your leases with beautiful specimens that you have seeing and mounted yourself. You can beaute his meaning the left for others. Many specimens are becoming your formations of the developing the formation. One medical writes up: "he's made the developing my machine the lease of the developing my specimens and mounted by or others. But have those and any any specimens and mounted by or others. But have those and a number fetture.

FREE Resident the necessary of technical formation of should be necessary to the Mount Dispute the necessary of technical developing developing the many of the formation of the per form you can happy the formation of the obtained of the second of Turkburney 1701 December 1800.

Edison, at 79, Still Stalks Nature's Secrets

Continued from page 132)

of his own affort to give the world more new things. But I am glad he poked us on our general intelligence. He once told me that man needed to develop about two more twists or convolutions of his gray matter. Also I deduced from that answer that there is a shortage among us of real brainy mechanics and a chance for bright young fellows to qualify as operators of high grade machines.

"How about the American chemical industry versus foreign competition—for example, German synthetic wood alco-

hel?" I saked

"American chemical industry is in the making. Germany is still ahead, but not for long."

THE inventor might have added that he himself gave the domestic chemical industry quite a boost during the war, manufacturing beaud, carbolic soid, and a substance that has a name of nine svilah.es

'Do you still cut down on sleep, Mr.

Ed son?"

'No," evidently meaning that the sleep period is now fixed

"How much do you sleep?"

"Five to alx hours. The quality is still

perfect."

While ever hostile to sleep, Edlson has been wont to land special campaigns against Morpheus at times when there was a big problem to solve. A member of his famous "insomnia squad" told me about a notable campaign of this nort which took place about a dozen years ago. The problem was to replace the phonograph recording cyclinder with a disk of a new, virgin type. For three weeks "the old man" shut himself in the laboratory with a faithful few and never left it, day or night. His food was brought to him: he took extraps on a cot, totaling perhaps three hours of slumber out of each 24.

At any time he could have been whisked home in a car in five minutes—a fine comfortable home up the hillside in Llawellyn Park-but he had vowed not to leave the scene of action until that enemy problem was licked. His alds were permitted to go home for a little rest, if they liked, after each 36 hours of fighting in the trenches. Overtime pay? Yes. They did get paid in hearing the boss tell endless funny stories of a Chaucerian nort and in working shoulder to shoulder with the greatest human

dynamo in the world.

THE boos used to keep a box of good cigare on his deak. He noticed once that they did not last very long and he mentioned that fact to the man who manufactured the brand specially for him.

"I'll tell you what, Mr. Edmon. I'll make up some cigars out of rubbush—you keep that box open on your desk for these self-helpers. Keep your own box of good cigars locked in your deak."

So it was done, and shortly efterward the tobacconst asked Edison how the little scheme worked.

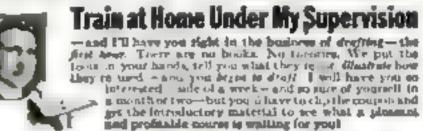
Continued on page 1.35)



Smarter than

Do you want a man's size pay envelope? book learning? This chap never finished e with grade at school. But he looked the field over and chose the line nunction out of twenty Help II anted ads called for He learned the line that a olways in demand. He wrote to me in February By the middle of May he was a draftsmen. Today, my must brought his photo and the statement, "I've heen made Assistant to the Chief Draitsman at \$400 a month?"

Six Months in empiriture for anymor to learn draftens subject to be been draftens subject and And you need no "talent" for drafting. It was more in war a garage, said when he started my course! Smart? Yes. Smart enough to pick the forms that is all feducity.



You **Keed** Only the Will to Start

We have everything required to put you in the highpay they every long but your name and address. If you ship the major were and man R - we I make

the new to an by new tools.

He had the k in a supply and demond that regulates everyone's pay. What good is a machinist if every shop has a walking that of walking men? What does a bead crammed with a certicity get you when received shops have agreed "NO HELP WANTS ED? I list every industry in removing for draft onen. Just check this up in the Want Ad columns of any newspmper.J

TORS WAITING all over the U.R. by becaused, as you around their becaused, as you around their de Persons from our offices, We haven't students chough to an round a get new and next round a get new and next round it was there in to the act act act on Fill formath hould without dates charge.

> So Cily Coupon NOWI

Nove Is Proof The ORAFTSMANSHIP Loads the Field

There can be no paintains about the field for you flead before the partie that of 14 282 articles and paint where the drafts man a work comes likely

Accordings, and Parts. Agen seleural Lungles

mente Aren peu rog Automobiles Building Burnin Mendgen Lommutatory littee Touls, Jigs, Esc. Maretors knd inne

Muctainal Fuentimes Heréwere tree end Steel Products

Jewelry Laboratory Apparatus Locumetives Mechines (All Kinde)

Mutu, Bolto, Bernna Francisco. Ranway Equipment Structural Steel Store Fronts

Telephonee Yalve? Wespes Wire Products

Zinc Specialties

You Seffer If You Wait NO

un, Chier 1 Div. 12-61, 1951 Lawrence Ave. WITROUT OBLIGATING HE and full information beautiful empty you space practical disformations, 2000. beautific way you seach practical it aft new emparged SURIK, and free tool offer

delema



Better

Things of

NOW

about brarubig.

drafteman, and a quest ar lignerwater to the product the tree, it is the took it as basics a

the

LHe

Tour Own Russ to end you railed have a co fre-production principle stepsome or a dra steam's uni-





tog able, rul s squares, stipplies all included | So write at once, Let Ambition Guide You

Ji Yoq Agewar Thir in Th

To the next hery men curothing 'no cuty's change for the service and outful Full art of repeated near a left, we long increases a a Conf of Own draw

all.

a needpf to

dut doe t let al run goody. They'd Are. many many schools hat track that anything Shoot for the bue he is practical - principle Get the honoring every includery made and is willing be pay but.



Follow this Man:

Secret Service Operator 38 Is on the Job!

COLLOW him through all the exestament of his chase of the counterfeit gang. See how a crafty operator works. Telltale finger prints on the lump stand in the mur-dered girl's room! The detective's cigarette case is handled by the unsuspecting gangster, and a great mystery is solved. Better than fiction. It's true, every word of it. No obligation. Just send the coupon.

The Confidential Reports No. 38 Made to His Chief

And the best part of it all is this. It may open your eyes to the great future for YOU as a highly paid Finger Print Expert. More men are needed right now. This school has taken men just like you and trained them for high official positions. This is the kind of work you would like. Days full of excitement. Big malaries, Rewards.

Can You Meet This Test?

Can you read and write? Are you embitious? Would you give 30 minutes a day of your space time preparing yourself for this profession? Would you like a life of excitement, thrilling adventures and high pay? Answer you and I'll show you how to attain all this.

Send the coupon and I'll send the Free Rerocts - size a wonderful illustrated book felling of the future awaiting you as a Finger Print Expert,

T. G. COOKE, Free.

University of Applied Science

1929 Supervaide Ave., Dept. 13-61, Chicago, Ill.

 University of Applied Science 1930 Sunnyalda Arm., Days. 18-61, Chicago, Ill.

Gentlemen. Without any obligation whatever, produce voir new fusty illustrated Free Book on Finger Prints and your special offer of a course in Secret Service Intelligence and the Professional Finger Print Outfit that I can get now at no extra cost.

Edison, at 79, Still Stalks Nature's Secrets

(Continued from page 123)

"Say!" exclaimed the inventor, after scratching his head. "The deak box is empty Guess I forgot and smoked 'em myself!"

The boss often burrowed tohacco from his laboratory men, I was told, using the same 10-cent brand that they liked One of them set up a tobacco shop in the laboratory for mutual convenience. Edison patronised it to the extent of two packages. a week, but overlooked the detail of payment. The employee couldn't dun the bom for casual dimes. Some one advised him to send a monthly bill to the inventor's secretary. He did, and was promptly paid, then and afterward.

WHILE on this anecdotage, I'll include one of the latest going the rounds of the works-which illustrates several things, including the infinite detail. that occupies the inventor. At the peak of production the great buildings have housed over 10,000 employees. The story goes that Edison, making his usual rounds, saw a weight on a door on Monday and he sent his usual note, "Weight no darn good. Take it off." It was taken off. On Tuesday he cent another note, "Where is that weight?" It was put on. On Wednesday the boss wrote, "Why hasn't matter been attended to? Weight still there. Why don't you do something about it?" The adjuster of weights took the note to his superior and said: "I can't answer this." The superior said "Leave it to me," and he sent the following to Edison:

"On again, off again, on again, Finne-

Monday, Tuesday, Wednesday. On Thursday we'll take it off, Friday we'll put it back, Saturday have it off again

But what the will we do Sunday?" Doubtless the boss started to scratch his head over this estudion and then had a hearty laugh, for no one likes a joke better. He "razzes" his men and doesn't mind a return. As far as this door yarn is concerned, I wouldn't be surprised if the weight on and off was an experiment; perhaps a psychological test of a dumblooking janitor.

ASKED Mr. Edison about his present diet and he replied:

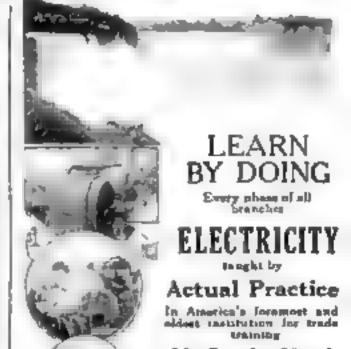
"I eat very little. The amount of power one can get out of a piece of toast is marvelous. What menu? One and one-half glasses milk, tablespoonful cooked outs, one sarding each meal. Weight constant-186 pounds."

This menu is followed for weeks at a time and it includes all meals. inventor used to weigh himself every day as a check up on his rations, increasing or diminishing food allowance according to the record of the scales.

"What is your present view of college education?"

"Impracticable," was the terse answer Every one recults the Edisonian strate against colleges a few years ago and how the higher learning was put to a seemingly

Company (197)



16 West 17th St., New York City TING Lessons to areve you san learn AT HOME

OUTFIF GIVER Putl s pp.

in your spare time! I have made lived ing an aim do to lived, the any letters we control action of the lived in the lived in the pew occase to the pew occase to the lived lived in the lived live

Train'r Job mi Raise If you we earning both their that I style to be seen to the little that I style to be seen by your thank his meriting its a few must be to be seen to be to

Chief Drafting Engineer



No Books Used

Individual Instruction Start Any Day

Wifte for FREE 84-page estates

THE NEW YORK

ELECTRICAL SCHOOL



its (ause and fure per C-Brit-The Black Property

Ethiamin N BOSOF 7 12 3 Regue Burlding 2 | 47 N 18. \$1. Indianapolis

\$100 in Prizes

See Cash Prize Offer on Page 4 in front advertising section

Edison, at 79, Still Stalks Nature's Secrets

(Continued from page 13-1.

diagraceful rout under a questionnaire bombardment. That warfare was perhaps embittered by the fact that a number of college graduates were employed in the experimental laboratory. All were surve, hopeful young men, I was told, and when the boss asked them what progress they were making on a problem, they replied that they had just about won. However, on the test, their work usually fell to pieces. This seemed to prove to Edison that colleges merely turned out rank optimists. On the other hand, the selftaught, roughneck members of the laboratory staff were inclined to be more conservative, even pessimistic, on their progress; and when the test came, they often gave Edison a glad surprus.

THE famous questionnaire, comprising hundreds of inquiries on every aubject from calculus to cucumbers, has not been used on job applicants for some time. Instead, I believe, the boss gives the applicant a searching visual "onceover" At least he did this the other day to a young chap who was going on the road as a salesman. The young chap said nothing while the bose and his secretary exchanged some shorthand notes; he was just inspected and passed. A while back all employees were dusciplined with the questionnaire, save a minority of veteran roughnecks who declined to say whether they had read George Ellot. Nor did these rebels suffer for their attitude.

"Can you give a little advice to young men on how to develop creative talent?" I maked the inventor.

"Young men do not take advice," and Edmon gravely, perhaps with a very slight twinkle in his eye. He added "Creative talent apparently cannot be acquired "

Of course we know that millions of young and old men have taxen a lot of Edison's advice and they'll keep doing so for a long time to come. He has fairly forced his advice on the world in voice. song, and light. You but we take his advice! As for creative talent, hasn't be told us we're all due to grow another loop of that gray matter?

My next query was framed to match the apparent tone of his last response: "Has man progressed mentally in the

last 50 (or 5000) years?"

A few years ago I believe Edmon rapped out a still negative to this very question. You can judge whether he is not now mellower and more hopeful of humanity by this answer:

"Yes. The number of men in every nation, per capita, who are honest, humane, and highly intelligent in increasing. This number is a measure of our civilization. The Lord appears to be in no hurry "

"Will man yet attain a drudgeless world through machines or by tapping the

power of sun, tide, or atom?"

"There is no limit to the invention of fully automatic machines," replied Edison. "Man will work less and less."



Daring Young Men Needed in Aviation

PREPARE

For One of These

POSITIONS

Apronautical Instructor

566 to \$150 per week

Asronautical Engineer \$100 to \$300 per week

Auronautical Contractor Energious profits

Aeropiano Repairmen

Aeroplane Muchanician

\$40 to \$45 per week

Auroplane Salesman 2000 per year and up-

Asroplana Inspector 250 to 270 per week

Aproplane Assembler \$40 to \$45 per week

Apropiane Builder \$75 to \$200 per week

\$40 to \$75 per week

SHERE is no field of work in the world today which offers such amazing opportunities to young men of daring and who love adventure. as does Aviation. Although still in its infancy, there is a crying demand in Aviation for young men with courage, nerve and self-reliance. For these who can qualify there will be thousands of highly paid jobs which will lead quickly and surely to advancement

Big Opportunities Await the Trained Man

and success.

Look over the fields of work which are open to the young man today You will find that Aviation is the ONE FIFLD that is not overcrowdedthe ONE FIELD in which there is plenty of room ar the top. Thirk of it' Only at years ago Orville and Wilbur Wright made the world's first airplane flight. Now airplanes fly around the world. Yes,

Aviation offers the same wonderful opportunities today that the automobile and motion picture industries did 15 and 20 years ago. Men who got in on the ground floor of those industries made fortunes before others woke up. AVIATION 15 NEWI It clamons for nervy young men-and the trained man has the world before him in Aviation.

Easy to Become an Aviation Expert-\$50 to \$100 a Week

You can qualify now quickly for one of these exciting, highly paid jobs through a new, sure, easy method of training The study of Aviation is almost as interesting as the work itself. Every lesson is fascinating and packed full of interest. That's why Aviation is so easy to learn-you don't have to force yourself to study—once you start, you can't get enough of it. Only one bour of spare time a day will give you the basic training in an amazingly short time.

One attident, S. F. McNaughton Chicago, says.

Vous lessons are like a somence, and what is more after me reasons he student griss a thorough understate up a me new tors it are it easy at them. understanding one per the student griss therough indeed there. Parameter and test pays "I not madeed numbered that such a valuable student as the said from such practical man for the stiff cont

Personal Instruction by Experienced Men

Men who have had actual experience in Aviation give you personal attention and guide you carefully torough your training | hey select the lessons, lectures, blueprints and hill ctass. They tell you the trongs that are essential to your success, Every lesson is easy to read and quickly understood.

Big Book on Aviation FREE

Send coupon below

for New Free Book, just out, "Opportunitien in plane Indusinteresting and instructive and will show you many things about Aviation which never knew 370% before. Only limited - 8 number offered get voars before the edition is exhausted

AMERICAN SCHOOL OF AVIATION 3601 Michigan Ave., Chicago, III.

AMERICAN SCHOOL OF AVIATION, 3601 Michigan Ave., Dept. 1361, Chicago, III.

Note at any obligation send me your Free Book. O restrabilies in the Aurilage Industry also, of musical about your Course on

Name

Practica Actorno nos.

Sureet

City

State

DOyon want money? Do you want independence? Do you want a sure trade that pays \$50 a week up? Do you want to travel and see the world? How would you like a good driving job? Or a place in a repair shop? Or your own service or tire or hattery station?

If you are willing to work for a few weeks you can absolutely seemen yourself to make your dream come true. You but need experence you and need clouding. The ham as Sweeney System of Peacts al Instruct in sever ght my at the Sweeney School, Lansas City, Mo.



Big Special Offer!

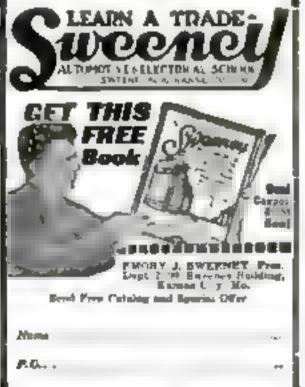
Jobs Open

1150 is 1800 1180 to 3100 Joefrinten, #225 54 in 178 o day

SPQ to 8190 Treat Britons, \$128 fire, \$ 001e5200 Welder \$1401e5200 Indian, \$150 to \$300

If You're Nacioalcally Inclined beru is your opportunity. There is a fine job ready for you, I refer you hoover 40,000 Awamey - trained men from farms and mult towns who have made great, 17 million automo-bres in U.S., In my milbile in U B, In my mil-lion during auto echon I train you for high paid jobs in a few weeks, Hamember, my unaxing offer right new means a lot to you-but you must not quick.

Simply send name today or clip rosposfor my not usee ablancement a make a fire and once eat his way about oppositionables on and husiness and shows how we train men their hands instead of learning from books. Come and mode at the sunthin biquest and mod pages rease wheat See how the men-like the World hand at Sweeney System tel the facts also a low many I is now he make big maney do ng work you he. Be no set tent. Travel. See the world. Own your sen garage, tire shop, battery station. Take the first step new by sending for this big free book. Special Radio Course free to column the most mixty days. No column attendant mane this colored stiments scoopled. Remember, this is the most amaging offer I have ever made in the bistory of this school.



Snakes Are Safe if You Know how to Pet Them

(Continued from page 21)

"That fat three-footer with the beautiful circular dengo on his flanks is an urutic He's an britable little cum. Watch!"

Josquim poked at the make with his stick, and the reptile instantly struck blindly right and left, without coiling. "He thinks he's a machine gun." said Joaquim. "He strikes so often and so fast that he doesn't bother to take aim. The law of chance is in his favor. The urutú is abundant, and he cripples when he doesn't kill. One of his victims was brought here for treatment. She was totally blind, vomiting blood, shaking with chill, and barely conscious. She had been bitten less than an hour before. You would have said she was already past hope. It took two injections of serum and two days of care to cure her.

"THE bolpeva, which also strikes from I flat on the ground, without coiling, and the white-tailed jararaca that you see over there, are close relatives of the others I've mentioned, but aren't so common nor dangerous. Your moccasins and copperheads in the United States are allied to these species.

"Now here we come to Mr. Cascavel, the Crotains terrificus, the bolcinings—in a word, the good old always-unreliable rattler. We have only one species of rattler in Brazil, compared with the dozen or so that you have in the United States -but our one is quite enough. It is venom is five times more active than any other we have studied. He is common and savage: slow to act, it is true, but deadly cure. Our kind friends on the fazendas, or farms, send us as many as two thousand living specimens a year.

"A victim of the rattler should receive serum treatment within two hours, to be safe, and should be watched for as much as three weeks, during which period the dangerous symptoms may crop out again even after an apparent cure.

"There are about 500 known species of poisonous snakes in the world. The rattlers and moccasins and these Brazilian snakes I've shown you are closely related. All have fungs with a hallow tube through which the venom flows. But we have quite another kind of snake in Brazil-those gorgeous little coral snakes that you see over there. They are related to India's devastating cobra. You can see the similarity in shape long, thin, and graceful, and if you cared to examine their teeth, you would find that their langs bave only a trough, or partially open canal, through which the powon flows, instead of a wholly inclosed tube as in the case of the other anakes you've sect."

I TOLD Joaquim I'd take his word for it about the fangs; but I couldn't help admiring again, just as I often have in the jungles, those dainty little coral anakes, with their brilliant bands of red, black, vellow and white. They are deadly in the extreme -but fortunately their coloring, like a gaudy bead necklace, makes thern conspicuous.

Next Josquim pointed out a long, grace-(Continued on Juge 137)



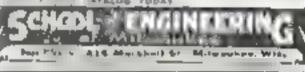
A Complete Conservatory Course By Mail Windowfal home state receive lessons mades great American and Enterprise tractions. Industried by Palercowsky. Master teachers guide not comb-red. Lessons a marvel of simplicity and completeness. The at y recognized Connect story of Music giving has be the t NIVERSATY EXCLUSION MATRICE.

the sheet of a general Conservation Marting.

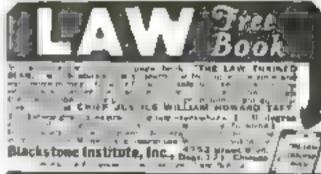
The sheet of a general Conservatory of Made for hung study hand open intercept containing the greats of the Martin Study hands open intercept containing the greats of the Martin Marting apparently of Magner Monaments, and the Marting apparently of a master—the indentined from the norm memory post event.

The University Extension Conservatory, by adopting the formant instruction Method, has placed being quality the formattion of the martin. Asymptotic mounts of the property of the part of the post of the part of the par EMIVERSITY EXTENSION CONSERVATORY











STUDY AT HOM The state of the s

A SERVICE FOR

In Buying Sadio & Tool Equipment For lift of traind and approved products will to the Popular Science Institute of Standard See Page 5.

Snakes Are Safe if You Know how to Pet Them

(Continued from page 136):

ful serpent, bluish black in color, "A musurans," he said. "He is nonvenomous himself, and he delights in esting venomous snakes. In five years this one has eaten 112 rattiers and jararacas, some of them bigger than himself.

"Oh, for a long time, we had great hopes of that fellow. We were going to breed him, and scatter his kind all over the fazendas, to play the other snakes. He is one of the few living things that is immune to the bites of poisonous serpents.

"I'VE seen a museurana crawl up to a jararaca and unconcernedly twine himself around the latter's body, even though pricked by the poison fangs several times during the struggle. Slowly the mussurana would wrap the larger snake in tightening coils, and finally would get hold of his enemy's neck. The letter would hardly even fight-be was relying on his venum to weaken his advereary shortly, as in all his past experience it had always done. But when once his neck was gripped in the museurana's Jawa, the battle was over, and the mussurang was soon absorbing as much of the inverses as he could hold.

"Apparently there is only one anake whose poison is deadly to the mussurana, and that is the pestiferous little coral

"But our scheme of breeding mussuransg up protectors of the fazendas basn't worked. We receive very few specimens, and we can't keep many of them alive in captivity. For a time we firted with the idea of using wild hogs to fight snakes. They too are nearly immune to venom, but for a different reason. It is simply that they carry so much fat that the poison rarely gets through it to a vital anot. And they like to est makes. But the planters won't have them around, for they destroy crops as well as serpents. Now we have another white hope in the national offensive against serpents. It is this little Brazilian skunk, which seems to be a natural born unake slayer. I'll ahow you "

THE skunk was put into an inclosure with a caseavel. He approached the with a cascavel. He approached the rattler, sniffed it, and was promptly bitten three times. We could see the blood from one bite on his nose, and even a trickle of the over-abundant venom The skunk meditatively raised a paw and wiped the injured nose—then decided be was hungry. So without more ado, he simply bit off the rattler's head and ate it with relish, poison glands and all.

"He won't suffer a bit from that poison," and my guide. "Yet any one of those three bites would have slain you. The skunk is blessed with immunity—and I don't think science really knows what that is. Each snake is relatively immune to the bites of others of the same species. The amount of rattler venom necessary to kill another rattler, will kill 10 makes of other species, 24 dogs, 60 horses, 600 rabbits. I don't know how much venom would be necessary to kill one of these

Continued on page 138)



Make More Money

Read the Money Making Opportunities on pages 120 to 150 of this issue.



Common Education Sufficient

+1 + 1++ 1+1 + 1 +17 + distress.



Become An Artist This Easy Way

Thousands who never dreamed they could draw can now easily become artists. You too—without any previous training—and no matter how attle apparent talent yet, have scan now easily learn thinstrating. Designing and Cartooning through this amazingly easy method.

You learn at home yet your work receives the personal attention and criticism of one of A nerica's most successful actists. Many students actually soil enough work during their training to pay for it many times over

Big Money in Commercial Art

Millions of dollars are being spent this year on advertising and mory illustrations, commercial designs, and cartoons. And even more will be spent this year. Commercial art is a trumendous field—and a field where very big money is gladly poid anyone who can produce good art work. Advertisers, magazines newspapers, printing bouses, bosiness concerns all need trained art sts. Competent artists easily earn from \$50 to far over \$300 a week. And now you can easily enter this "world's most fascinating, best paid business."

Mail Coupon for Free Book

A new handsomely illustrated book has just been printed, which gives all the most up-to-date information on the thousands of wonderful opportunities in Commercial Art and shows how this startling short cut method easily enables you to enter this field. It tells about our students—their success—what they my—actual reproductions of their work—how they made big money while studying. This attractive book will be sent without cost or obugations. Send for it. Mail coupon now.

Washington School of Art, Room 241-D 1115-15th St., N. W., Washington, D. C.

WASHINGTON SCHOOL OF ART. Reem 141-D, 1116-1216 St., N. W., Washington, D. C.

Please send me without cust or obligation your ties birds on art. 'Quick Fasy Way in Became an Artist.' and details of your special offer

| Name | i | white | إصنهام | y Áče., | ñ. | PT | M bas | - |
|------|---|-------|--------|---------|----|----|-------|-------|
| | | | | | | | | |

Ottom

Snakes Are Safe if You Know How to Pet Them

(Consumed from page 237)

akunks. We hope that ultimately they may prove to be a valuable ally in the

war against snakes.

"But today the only real hope is the serum. The way we make it is fairly simple. The venom is extracted by holding a snake and forcing him to strike with his fangs on a giam vial, which receives about haif a tempoonful of the poison. This is diluted and otherwise treated, and then injected into the horses that we keep for the purpose. Doses growing gradually stronger are given repeatedly for about six months. By that time the home's blood has developed an extraordinary resistance to the poison. We draw off then about six quarts of his blood and from this the serum is made.

"INJECTED into any snake-bite victim, this serum apparently neutralizes the effect of the poison until the victim's own glandular system has time to rise to the emergency and conquer the poison.

"You often have read of many methods supposed to cure snake bits. Making a agature, sucking out the venom, taking brandy and cathartics, and keeping the puncture open with a packing of sterile gauze all are recommended. Down here, from repeated experiment, we are convinced that all the familiar recipes are quite futile. The snake venom fixes itself on the hervys, in the tissues and blood, with devastating rapidity. Once you are hitten, it is too late for any cure except serum.

"All reported cases of cures by these other methods mean merely that the snake was not a poisonous species, or else that his fangs did not administer a

normally (atal dose.

"Our daily association with anakes here has upset a whole raft of superstitions. Snakes will not pursue you. They will not attack you unless disturbed. They cannot leap through the sir, as our natives firmly believe. They cannot hypnotize anything. We have repeatedly tested on birds, rats, and toads this widely credited hypnotic power of anakes, and we know they have no such power

"ANOTHER superstition has grown up around the snake's forked tongue Not only our natives, but many educated people think that that flashing pink tongue is a poisonous sting. As a matter of fact, it is nothing but a feeler, and is utterly harmless. The two fangs, which fold back when the mouth is closed, and spring down into striking position when it is open, are the only weapons the snake has.

"Here, help me hold this rattler a minute, and I'll show you—" There Joaquim went again, picking up enakes! I'd had enough. I told him that I must go to keep an engagement with wild Indiana in

the jungle.

I've learned today that you are perfectly safe with anakes if you have plenty of serum, and wear leggings and gloves, and know how to handle the reptiles. But I rather suspect that you can be still safer by not handling them at all.



Practical aducators for an Engineera, Firemen, Machinists, Electricians and engineer students, Light valuable, up-to-date Guides treating on the theory and practice of matern Engineering in



A COMPLETE HOME STUDY COURSE AND REFERENCE LIBRARY Drocket numbers with Reads Reference and the Bild course of the substations Pary turead. High world read. A good heart in the string East near a License. Price 442; e man il per ture h. F. ee Tita.

INFORMATION: — In A Handy Form.
Antwers to Your Questions and Problems.
Here is a partial for if the subjects from the subject from the subject

SHIPPED FREE
Not a cent to pay until you see the books. No
abbiguiton to buy anyon you are satisfied. Pill
in coupon in peacl. Send now-lodgy-get this
mandard library for Engineers and Mechanics.

FREE Thee Andel & Ca. 85W 33St, N.Y City Send me AUDELS ENGINEERS AND MECHANICS GUIDES.

COUPON is unmbers, \$12. for free examination. If satisfactory, 1 will need you to a 7 days. Thee \$1 monthly until \$22 is paid.

Adjust and a second sec

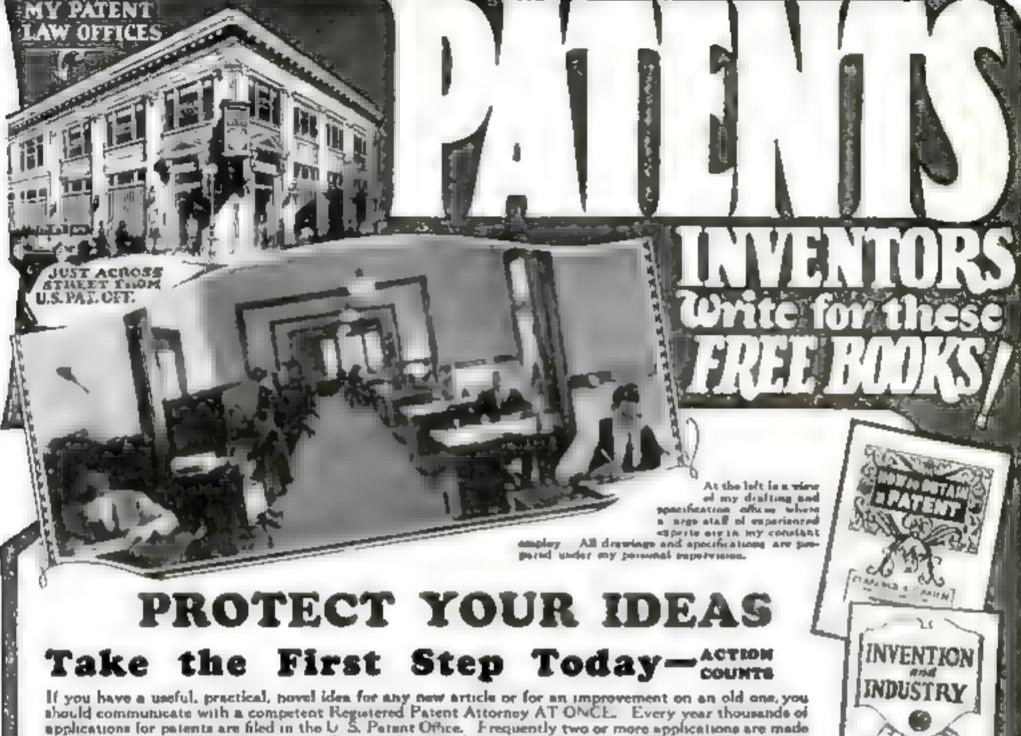
Biopiopal by secretarian secretarian 1.1 4

Your Choice \$2,000
Musical Instruments

Your choice of a Violin, Tenor Banjo, Hawaiian Guitar, Banjo, Cornet, Ukuleia, Banjo, Ukuleia, Guitar, Mandolin or Banjo Mandolin. You will be proped to own any one of these assistances and you can have the absolutely free. A few cents a day for lessons in your only expense. Our system of teaching is so easy that you can play several pieces by note with the first four lessons. We guarantee success or no charge, instrument and lessons sent on one week's free trial, Write for bookiet tolay no obligation.

CHICAGO CORRESPONDENCE SCHOOL OF MUSIC Brokerd and Wilton Streets, Days. 24, Chicago, Illinois





If you have a useful, practical, novel idea for any new article or for an improvement on an old one, you should communicate with a competent Registered Patent Attorney AT ONCE. Every year thousands of applications for patents are filed in the U.S. Patent Office. I requently two or more applications are made for the same or substantially the same idea (even though the inventors may live in different sections of the country and be entirely unknown to one another). In such a case, the burden of proof resis upon the last application filed. Delays of even a few days in filing the application sometimes mean the loss of a patent. So loss no time. Get at touch with the at once by mailing the coupon below.

No Charge for Information on How to Proceed

The books shown here contain valuable information relating to patent procedure that every inventor should have. And with them I will also send you my "Record of Invention" form, on which you can sketch your idea and establish its date before a witness. Such evidence may later prove valuable to you. Simply mail the coupon and I will send you the books, and the "Record of Invention" form together with detailed information on how to proceed and the costs involved. Do this NOW. No need to lose a minute a time. The coupon will bring you complete information entirely without charge or obligation.

Prompt—Careful Efficient Service

This large, experienced organization devotes its entire time and attention to patent and trademark cases. Our offices are directly across the street from the U.S. Patent Office. We understand the technicalities of patent law. We know the rules and requirements of the Patent Office. We can proceed in the quickest, safest and best ways in preparing an application for a patent covering your idea. Our success has been built on the strength of careful, efficient, satisfactory service to inventors and trademark owners located. to every state in the Union.

Clarence A

Member of Bar of: Suprame Court of the United States; Court of Appeals, District of Columbia; Supreme Court, District of Columbia; United States Court of Claims

restles seedined exclusively to Petents, Trademarks and Copyrights

Strict Secrecy Preserved Write Me in Confidence

All communications, sketches, drawings, etc., are held in strictest confidence in strong, stud, breproof files, which are accessible only to authorized members of my staff. Feel free to write me fully and frankly. Your case will have my personal attention. It is probable that I can help you. Highest references. But FIRST-clip the coupon and get my free books. Do THAT right now.



CLARENCE A. O'BRIEN

Registered Patent Attorney,

5395 Security Saving & Commercial Bank Bldg , Washington, D. C.

Pleased send me your free books. How to Obtain a Patent." and "Invention and Industry," together with your "Record of Invention" form without any cost or obligation on my part

Name

Address

(Important: Write or Print name charly)

PATENTS

TRADE-MARKS
DESIGNS
FOREIGN PATENTS

MUNN & CO.

PATENT ATTORNEYS

Associated times 1846 with the Scientific American

683 WOOLWORTH BUILDING
New York Cay

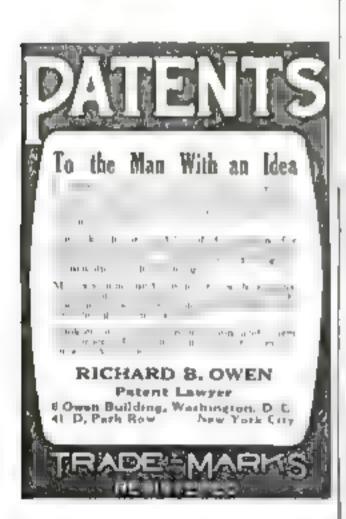
522 SCIENTIFIC AMERICAN BLDG. Fashington, D. C.

1311 TOWER BUILDING

664 HOBART BUILDING San Francies, Cal.

519 VAN NUYS BUILDING
Las Angeles, Cal.

Books and Information on Pateurs and Trade Marks By Request. Associates in All Foreign Countries.





NVENTORS PROTECT YOUR IDEAS

Send for our Guide Book, HOW TO GET A PATENT, and Evidence of Invention Blank, sent Free on request. Tells our terms, methods, etc. Send model or aketch and description

of your invention for Inspection and Instructions Free. Terms Reasonable. Best References.

Pandolph & CO. Dept. 130, Washington, D. C. Crev. State.

Lessons in Magic

(Continued from same (#)

Do thus a few times when all six papers are attached. Then, when you remove one, raise the knife, apparently as before, but as the point comes up, push your thumb slightly in the direction of the point of your forefinger. This will give the knife a half turn that will not be detected, but will let the audience see only the side of the blade that was visible when the knife was held in the lowered position

When you bring the knife down, of course, you pull your thumb in the opposite direction so that the half turn is reversed. With a little practice you should be able to show either ande of the knife at will.

ANOTHER little "table trick": Take a lump of sugar from a bowl, roll it out on the table and challenge any of your companions to set it on fire. When several of them have held matches to it unsuccessfully, you take it, or another lump, hold a match to it, and immediately the sugar begins to burn.

The trick here lies in applying a tiny speck of tobacco ash to the sugar You may do this either by letting the lump of sugar carelessly fall to the table or to a plate where you have placed a speck of ash, or by rubbing a little ash against the sugar with the end of your finger. The smallest bit is sufficient to start the sugar burning when you apply the match, for the sah and the sugar form a fusible chemical compound.

This is as far as I would advise any amateur to go in performing chemical tricks, for such tricks may cause serious accident and injury to a person who has not a thorough knowledge of chemicals and their effects. I have just received a letter from the sister of an amateur magician telling me that her brother had blown off one of his arms while mixing a flash powder of phosphorus and potash, and asking me to warn others against playing with powerful and dangerous chemical combinations.

THERE are a number of pretty and amusing effects to be obtained by folding and tearing paper. One of the best of these is what is called a "Jacob's Ladder." Fold the short edge of a sheet of newspaper to form a little "hem" of about half an inch. Roll the sheet down its length loosely into a cylinder about 14 inches in diameter. When six or eight inches from the end of the roll, insert another sheet of newspaper and continue rolling

Continue this process until your roal consists of 10 or a dozen sheets, or more, if experiment shows you that you can handle them. Be sure, though, not to make the roll too tight.

When you have completed the cylinder, flatten it down and tear out a piece as shown in the drawing on page 18. Fold down the ends as shown, flattening the center piece and smoothing all wrinkles out of the two ends. Take hold of the little bem in the center of one of the cylindrical ends and pull. Alternately pulling on the hem in each cylinder, draw out the "ladder" to its full length.

(Continued on page 141)

Lessons in Magic

(Contained from page 140)

If performing this effect unsided, it may help you if you put rubber bands about the cylindrical ends to prevent them from unrolling. Or you may ask some one to hold the ends for you, and then pull out the "ladder" by taking the ham in each cylinder in your fingers and backing away.

THE ladder, of course, seed not be made with newspaper. You can use rectangular sheets of almost any size—pages from a magazine, typewriting paper, colored paper; whatever happens to be at hand. The greater the number of sheets, of course, the longer the ladder; the limit is determined only by the number your fingers are strong enough to tear

These tricks, although more or less elementary, are, every one of them, most effective if artistically performed. Remember that misdirection is the secret of every magical illusion. Divert the attention of your audience from what you are doing, particularly at the critical moment in your trick. A most effective aid in bringing this about is bright patter, so, if you are to succeed as an amatour magician, you must acquire the ability to talk rapidly, continuously, and interestingly.

Self confidence to the point of brazenness is another attribute that the successful magician must have. You can never put over an illusion if you attempt to do so in a timid, bashful manner. And self confidence will come only from the consciousness of skill, won by patient,

ceaseless practice.

From the Editor's Mail

WHY do you read POPULAR SCIENCE MONTHLY? What articles interest you most?

The following letters are typical of the hundreds that come from our readers every month, telling us of the pleasure and profit they derive from reading POPULAR SCIENCE MONTHLY

Won't you write, too, and tell us just what you think about this magazine?

What an Inventor Says

I am a man who has been inventing since I was 18 years old, and today I am 46 years old. I have read a good many magazines concerning inventions, but Popular Science Monthly is about the best I have read.—P K., Mamaroneck, N. Y

No More Haphazard Buying

Kindly send me the list of tools which the Popular Science Institute of Standards has tested and approved. I, for one, can appreciate such service as I often have bought tools only to discard them as worthers.—J. W., Evergreen, L.I., N. Y

Wouldn't Miss an Issue

I have been taking POPULAR SCIENCE MONTHLY a long time and wouldn't mass an issue. B. A. H., Montreal, Can.

Interested in Astronomy

I subscribe to your magazine because of your estronomical articles.—W D U, Niagara Falls, N Y

PATENTS TRADE-MARKS

Have You An Idea? Our Offer: FOR THE PROTECTION OF YOUR INVENTION YOUR FIRST STEP



Before disclosing an invention the inventor should write for our blank form

"RECORD OF INVENTION"

This should be signed and witnessed and returned to us together with model or sketch and description of the invention for

INSPECTION and INSTRUCTIONS

Vo Charge for the Above Information

Our Four Books Mailed Free to Inventors

Our Illustrated Guide Book

HOW TO OBTAIN A PATENT

Contains full instructions regarding U. S. Patents. Our Methods, Terms, and 100 Mechanical Movements illustrated and described.

OUR TRADE MARK BOOK

Shows value and necessity of Trade Mark Protection Information regarding Trade Marks and unfair competition in trade.

OUR FOREIGN BOOK

We have Direct Agencies in Foreign Countries, and secure Foreign Patents in shortest time and at lowest cost.

PROGRESS OF INVENTION

Description of World's Most Pressing Problems by Leading
Scientists and Inventors

IMPORTANT

TO MAKE YOUR CASE SPECIAL AND AVOID DELAY YOU SHOULD HAVE YOUR CASE MADE SPECIAL IN OUR OFFICE to secure protection, save correspondence and obtain early filing date in Patent Office. To secure special preparation of your case send \$25.00 on account with model, or sketch and description.

All Communications and Data Strictly Confidential. Interference and Infringement Suits Prosecuted. Our Organization offers PERSONAL SERVICE by Experienced Patent Solicitors and Draftsmen.

We Report a Satisfied Client as our best advertisement, and formsh anyone, apon request, lists of clients in any state for whom we have secured patents.

Highest References—Prompt Attention—Reasonable Terms

Free VICTOR

ICTOR J. EVANS & CO.

Patent Attorneye

New York Offices Philadelphia Offices 1001 Woodworth Edg. 714-715 Liberty Bidg. Chicaso Offices 1114 Tacoma Bidg. Sun Franci

a Offices Fittsburgh Offices erty Bidg. 5.4 Em ire Bidg. San Francisco Offices, Hobart Bidg.

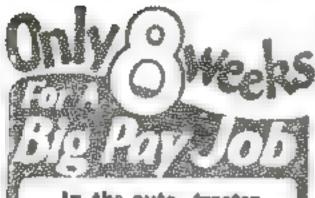
Mary Offices: 760 Ninth Street, Washington, D. C.

Gentlemen: Please send me FREE OF CHARGE your books as described above.

Name

Coupon

Address ...



in the auto, tractor and electrical business

Get my AMAZING OFFER

George W. Smith, of West A standard (L), did to a k weeks. Read this Dea. Mac I am clearing more than \$800 a month, 17| tell the world M. Sweeny trajuing put me over, Signed

George W. Smath,



J. H. McSweeny, World's large operator of Auto, Tractor and Electrical Tra. a. n.g. Shape-Cincinnati, Chicago, Claratand

I'LL PAY YOUR RAIL-ROAD FARE TO CIN-CINNATI, CLEVELAND OR CHICAGO, and YOUR BOARD FOR & WEEKS

BIG FIRMS NEED TRAINED MEN

I get calls daily from successful concerns for McSweeny trained men. They know McSweeny men are shop-trained, experts on autos, tractors and motors. That's why McSweeny men are in demand

My Training Unusual

Here's the big secret-erientific tool-training. train you with tools, not text

books, on modern equipment and in wonderful shops.

HOME TRAINING ALSO-Included in my special offer.

Write at once for my remarkable short time tustion offer.

McSWEENY

Auto, Tractor and Electrical TRAINING SHOPS

Eld to. Lette

CINNATI

VELAND-CHICAGO



What a Cleaner Has Learned about Your Clothes

(Continued from page 24)

electric machinery, you have much to do with fluide for storage hatteries, fluxing materials for soldering, and various metal polishes. And if you are a plumber, guard your clothes against mineral acids and soldering solvents.

OUR spotters, in tackling stains, are more cautious in their procedure than the average man or woman who tries to remove spots at home. When we cannot identify a spot, we follow a standard procedure for unknown stains. This is to avoid "setting" the apot beyond remedy. We use in the order given Dry solvents, wet solvents, semi-dry solventa, reducing agents, and oxidizing

Even then, special problems frequently

For example, we were swamped one day recently with 3000 men's shirts. sent by a shirt concern. Every one of these had been accidentally stained with dark varnish during building alterations. They were of various fabrics and colors. To insure a process that could safely be used, we sent samples of the shirts to our expert chemust, who made exhaustive testa.

These tests showed that a method that proved successful with the silk shirts changed the color of the cotton shirts. In the end, we had to adopt three entirely different processes—for the white shirts, for the colored silk and for the colored cotton whirts

New facts are constantly being learned in the science of removing stains, as an every other line of work, and new formulas for spotting solvents evolved. Glycerine, for example, formerly was used far more extensively than it is now, and ammonia was for many years looked upon by the earlier dry-cleaners as a cure-all.

JUST as a physician heatates to order his patients to take care of their own small lils, so I would besitate to suggest that people try to remove spots and stains from their clothing themselves. Yet there are a few methods for removing common stains that I think every one should know. They are:

Patty grease stores: On wash goods use warm water and soap; but on delicate fabrica une earbon tetrachlorida, which may be bought in any drug store under various trade names. On fabric likely to be injured by water, use absorbents, such as blotting paper, fuller's earth, French chalk.

Point: Try to remove paint stains only when they are fresh. If the material is washable, plain soap and water will remove them. Otherwise, sponge the fabric with pure turpentine. If paint is hardened, send to the dry-cleaner.

Axle preces, mineral vila, pitch: First rub with veseline, then apply carbon tetrachloride.

Tobecco: Apply warm glycerine when the labric is colored; hot dilute alcohol to white (abrice (but not to artificial silks).

(Continued on page 143)





Fried A. Manual Constant of the Action of the Manual Constant of the Party of the Constant of the Manual Constant

1,004 Mile Receiving Sel Qiven the Course. The new brane study me bots unity receipt in a short start paradically despite. No effect contact like it. Makes into a paradically despite. No effect on the paradit proper of all thereto. Send to it is not all all an inquiry on the analysis are given to the angle of the angle o

The Electrician's Wiring Manual

By F. E. Sengstock, E. E.

Contains all the information needed for the proper installation of lighting and power systems in housing and other busings.

It completely covers anade electrical wiring and construction in accordance with the National Electric Code.

> Pocket size—fleatble kinding 446 pp. Price \$2.50

POPULAR SCIENCE MONTHLY 250 Fourth Ave., New York City



sas 25 Shary Complete Facilities Palarentes. **ADAM FISHER MFG CO.

PATENTS

Trade-marks, Copyrights, Patent Latigation, Handbook with illustrations, 100 mechanical movements. Sent free on request.

ALBERT E. DIETERICH

Farmerly member Examin ng Corn U S Palent Office Patent Lawyer and solvening 77 pages experience

681-A Ourny Eldg.,

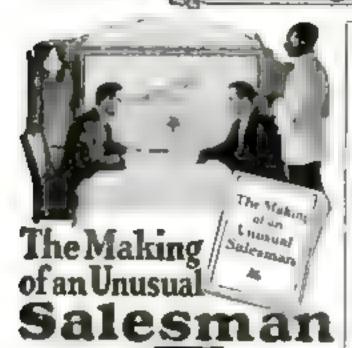
IED-D Enright Av.

Washington, D. C.

ST. Levis, Me.

PROMPTHERS ABSURED

Send drawing or model for examination, watson E COLEMAN, Patent Lawyer 644 G Street N W . Washington D C



Here are Some Big of the Records

After specified fearthers, point at sender-ing at a suffeed. I saw the settle paddring of special tables were out again. I saw he so more westers for evenews in the adding fixed to be a served in decreasy read offsite. The first money has not easily a date. I post i monicely mover has to be prove on I took up Lytin to braining. Colours are buylet by part provide made I'll need but to eith I averaged pathing than IST a day through not the form. that HT a day throng out the sam h

My minty was practice y doubled a short time ago but the greateston. In their coince from Law ng that the personnt of business bare a sit as his past is easily from them practice than be over

8 N William, Emtudy. With ar without previous experience, you may become an unusually successful salesman. Men who sent for this book from one to see months ago bave doubled their earnings.

If you are nothing to a trevenment or grantley appointed by the special part of the first property of the prop

If a marrowald cover is worth (we carry and two mire of poor time, ally and mad the suppose N. W.

LABALLE EXTENSION UNIVERSITY The World a Congres Business Francing Instances

Dopt. 183-3R Chicago
Please tell me obsert pure actory deciding place as appead
to me a present to the business first checker being and
place copy of Ton Yours Promotion in One, all military
plagations.

Chindre Salvenanchia

OBustoose Menagement Ditigher Avenumency D'Eraille Management Differency Renting

B

S

Now

Open

OLow, Degree of LL. D. Commercial Law Edudanteia) Management

Littudora Business Corris opendonce and Practice

Diffratory Paromagohip and Production Methods Dersonnel and taging ment Hanngement

Of speel Bankberping Districted English Commercial Specials

DEfective Aprehing Officialing and Planter Dk. P. A. Combins

EXAMN TO DRAW! BUT AND CARTERN NA. RESPONDENCE L SHALL

Wrestling Book



Frank Golch and Fare Parter from School of Wrenting. 1781. Bangs Mily, the

What Could You Do with \$50-?

See the Cash Prize Offer on Page 4.

What a Cleaner Has Learned about Your Clother

Making

(Continued from page 142)

Coffee: Use soap and water (not hot); then, if necessary, potassium perman-

Mud: Let dry and brush thoroughly. Sponge with alcohol (but not if artificial

Water spote: Dampen the entire garment, and prem while still damp.

Since people took to soft drinks, and to staying home evenings for radio concerts, and to going away for week-end auto trips, we've had to cope with stains that were unknown to our predecessors 50 years ago.

WHITE georgette wedding dress was brought to us by a young bride one day last winter. She had worn it two or three times, and wanted it cleaned, so that she could puck it safely away

The dress appeared slightly soiled, but otherwise spotless. However, when it came through the dry cleaning, we found a yellowah stain on one of the panels. Nothing would remove it. We finally sent the panel to our chemist for a report. Ginger ale or some other soft drink, spilled on the dress, and perhaps unnoticed at the time, was found to have boan the original cause of the trouble. If the young woman had told us of this in the first place, we easily could have removed the ginger ale by water brushing. As it was, an entirely new panel had to be sewn into the dress.

People did not chew gum a century ago, por drink malted milk, condensed milk, or even pasteurized milk. They didn't know the taste of ice cream. Indelible ink, road oil, perfumes, buttery acid, lipstick and rouge—these, too, are leaving the fingerprints of twentieth century civilization on our clothing. The dry cleaner receives this by-product in the form of new stains, to the removal of which he must apply all the ingenuity and chemical knowledge at his command.

ADVANCES in the industry have given the dry cleaners an equipment consisting of machines to cleaner the garments in the solvent (washers); muchines to remove this solvent from the cleaned garments by centrifugal action (extractors); and machines to dry and deodorise the garments (tumblets)

A recent revolutionary step in the industry was the introduction of the socalled "continuous flow" system. This made an automatic "clarifier" an integral part of the clearaing process. The solvent now flows in a continuous passage from the washer to the clarifier and back to the washer-returning as a cleanard solyent. This has eliminated the laborious and repeated rinsings in fresh loads of solvent

An even more recent innovation is the introduction of a semi-nonflammable solvent, a heavy petroleum with an initial boiling point of from 280 to 300 degrees P. and an end point of from 400 to 420 degrees. If generally used, it is hoped that this solvent will considerably decrease the number of explosions and fires in dry-cleaning plants, and protect the lives of the operators.



Thousands Enjoy Popularity!!

Properties of the pours. We man you by present ing this bianches of a spect of the manioral ten families of the want to be present or and drow families of date of the want of the present or and the wanter of date of the manioral read of the particular particular particular to the form banks of the present of the manioral read of the present of the manioral read of the manioral read of the present of the manioral read of the m

Learn in 30 Minutes With My Picture Method *

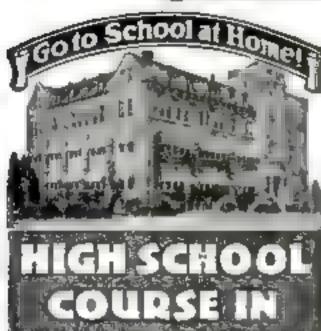
Arthur Bristens the highest pold burns of in the world entrancis? At at a significant the scale and the significant to remain the scale and th n in the property pay be a near by the first back of the Charlegal back there was all

Phonographic to pay gold the property of the pay of the

Don't Send a Single Cent

because you sight freget and mine this wanderful appearant tunity. It to got be the turn or punt to your carries





YOU ARE BADLY If you lack MANDICAPPED High School training.

You cannot attain business or social prominence. You are barred from a successful business career, from the leading professions, from wellpaid civil service jobs, from teaching and college entrance. In fact, em-ployers of practically all worth while positions domand High School training. You can't hope to succeed in the face of this handlesp. But you can remove it. Let the American School heap you.

FIT YOURSELF FOR R BIG FUTURE This course. which has been prepared by some of

America's leading professors, with broaden your mind, and make you keen, alert and capable. It is complets, simplified and up-to-date. It covers all subjects given in a resident echool and meets all requirements of a High School training. From the first lesson to the last you are carefully examined and coached,

USE SPARETIME ONLY

Most people idie away fifty hours a week. Probably you do. Use only one-fifth of your wasted bours for study and you can remove your present handicap within neg years. You will enjoy the lessons and the knowledge you will gain will well repay the time spent in study,

Check and mail the coupon NOW for full particulars and Free Bulletin,

American School Post. H-175 Oresiel Ave. and 50th No Chicada

American, School

Dept. E-175 Drezel Ave. & 58th St., Chia-Send me full information on the subject checked and how you will belp me win success.

| | Architact_ |
|----|-------------------------|
| | Mulauring Constructor |
| | Agumentilla Eng neer |
| | Autonobile Reputring |
| | Civil Engineer |
| | Structural England |
| | Beniness Manager |
| | Cret. Public Accountant |
| | Accountant and Aminor |
| 71 | Boukkreper |
| | Draftscan and Duslamer |

- Rischrich Engineer Electric Light & Power United Education Vocational Guidanes
- Business Law
 Lawyer
 Machron Shop Frank
 Mechanical Engineer
 Shop Superint-hident
 Limployment Man
- Etram Engineer
 Foremanship
 Eastlary Engineer
 Surveyor (& Mappin
 Telephone Engineer
 Telephone Engineer
 High School Graden
 Wirsteen Radio
 Underdan

What 10,000,000 People Like to Hear on the Radio

(Continued from page 64)

"Of course, there are freak letters coming in all the time," he continued with a amile. "If our chief announcer were not already married, he could have had a wide choice in wives from among the number of femining listeners who have fallen in love with his voice and actually proposed marriage by mail, sight unseen! Then there are the listeners who send in presents as a mark of their appreciation. Everything from a peck of extra large potatoes to a pair of fireman's beavy, red suspenders elaborately embroidered!"

Although talks and lectures do not seem to be rated very high on the scale of what the modern listener likes, thus certainly does not apply to such (extures as morning health exercises.

Tiff E director of the largest morning gym class in the world, who gets enormous numbers of men and women out of bed at 5.45 every morning just to exercise according to his instructions over the radio, told me that in the last year he had received upward of 100,000 letters from radio listeners who stated that they were consistently following his course

It is setimated that not 10 per cent of radio listenera ever write to a broadcast station, so it is easy to make a pretty good guess as to the actual number of people who follow his course

And that they are greatly benefited in shown by letters such as this-

You stated over the air this morning that you would like to bear from your radio audience regarding loss of weight through doing the exercises you broadcast every morning. I am. very much pleased to be able to report progress in that direction.

On March thirtieth last, I weighed 205 pounds and was getting one of those things that keeps a fellow from seeing his shoes. June fifth I weighed 198, July first, 191, August first, 189, and September fifteenth, 180 In other words, I lost 25 pounds in 5% months. Don't you think this gradual reduction in all right? I am now just about what I should weigh for my beight and age

The public wants entertainment by radio. They have received medical treatment by radio, and now they lose weight by radio.

Recent Publications

The Marvels of Modern Physics, by Joseph McCabe. Atoms, electrons, wireless electricity, and other wonders of physics explained. Illustrated. G. P. Putnam's Sons.

Our Innect Priends and Foot, by William Atherton Dupuy. Interesting stories of everyday insects. Illustrated. The John C. Winston Co.

The Engines of the Human Body, by Sir-Arthur Keith. The human body explained from the viewpoint of a mechanical engineer. Illustrated. J. B. Lippin-

Automotice Repair, by Homer J. Smith and Roy S. Kern. Working manual for students, automobile owners, and repair men. The Manual Arts Press.

A resident acheal—not a correspondence course



FIRE to the present electrical news as years. It over follogy has a drawed one in aftering the considered feether as after at a prime last oil) give topped follows he hadre they great the house or get be right that in his great fast growing, money making profession practical absolute the train of a safenguardness course. In his public that the train of a safenguardness course of a safenguardness of the same of the same of the same will take you couly 11 above weeks.

Wonderful Future in ELECTRICITY



You are standing sight. me the threshold of a great alocarical ago. Here is the clause of tout lifeis the chance of trait life.

The a get in on the growing facts of the g

The Practical Way to Start in the Electrical Business

The forcest elegating estatus offers the practical arounder was to a status bla vertice of the limit of an interest of the limit of the life of the li

Equipment - Finest Money Can Buy

An expense has been spated to make our equip-lated about of complete and he to the We have the a light hard or not a first of the wat, which is described. We have a property against a special care as 2000 colors in section of 10 of 10 Me local and a making instead generator, conscribing processed to equality about

the continuent and our methods make this the

Now is the Time

This winter is the ideal time to get just training. In 12 weeks you will be tendy to sign on a wordline lies of gath a fainte. You will be not be not be any fee the spring that when there will be more based for principles of a real case that a small chart of a spring only. There are chart of another of a springly impropriately for more was twelve to springly impropriately for more was twelve than the business.

Free Employment Service

Out the described department will help you get exacted to be right job as soon as you fought tuisting. If you term is care mouses while traching, we will attend a part to the job to diff, your common who common at each in shape time.

Don't Delay a Minute

Send in this contact and by return of you will get ou hig free book and e remarkable, offer made for a mail roop will get ou hig free boat and the remarkable after made for a limited met. The the courses were limited me,

Greer College -- Automotive and Electrical Engineering

Erwin Greet, President, Coper Cullege Automotive Electrical Engineers ing, Dept. 162, 2814 S. Wabach Ave., Chicago.

| Please send see electrical course. | Year It is | PREE | SIDOR Hook D | and | offer ada | (or Bot |
|---------------------------------------|---------------|------|-----------------|-----|--------------|------------|
| additional to any a | CHAT. | | | | | |

| į | Name | |
|---|------|--|
| | | |

How to Paint Your Car

(Continued from page 66)

for—one priming coat, then two coats of paint and a finishing coat of varnish. The first three coats have to be rubbed down with pumice stone or fine sandpaper and the car gone over with a tack rag. If I tried to do a real high class 'coach job' with many this coats, we'd be snowed under with the spring repair work before I could get it finished. Besides, I'd get tired of leaving the car here while I walked home every day."

THE bookkeeping and of the business at the Model Garage, which Joe took care of, being light just then, Joe had considerable time to spare. He pitched in to help Gus with the sandpapering and dusting

"Just see how easy it is to get the paint "nice and smooth with thus brush," Gus pointed out, when they had smoothed down the priming cost, and he began to apply the second cost.

"That's because you are using good

paint," said Jos.

"Sure it's good paint! Didn't I mix it myself! But if you'll take a good look at this paint brush you'll see why the paint flows so smoothly. That's no 39-cent bargain sale brush made out of pig's whiskers stuck in the handle with glue. No, sir! It's pure badger hair set in rubber, and I'd hate to tell you how much money I parted with to acquire it." Gus stated with the enthusiastic pride of a good workman in a fine tool

"So the brush makes a lot of difference, does it?" Joe asked with interest. "Why, I thought that anything with bristles in it would do. I'd have used a cheap brush that I could afford to throw away after I'd finished and save myself the

trouble of cleaning it."

"THERE'S where you're all wrong," said Gus with emphasis. "Cheap brushes may be all right to use on a cowshed, but you can't do a really fine job with 'em. They simply will not flow the paint on smoothly, and you spend half your time picking off the bristies that keep coming out of the brush."

By the end of the week, the first three coats had been put on. Gus made sure that each coat was thoroughly dry before he applied the next one. Of course, each coat was sandpapered lightly and Gus and Joe spent a lot of time on the

dusting

"Now comes the hardest job of all,"
Gus announced the morning after they
had finished sanding and dusting off
the third cont of paint. "Today I'm
going to flow on the finish varnish coat,
and I'm going to have it absolutely
smooth and glasslike all over or bust a
leg trying!

"Get the oil stoves going, Joe, while I wet down the floor and walls so that walking around won't raise any dust. Then when the temperature is up to 70 degrees you can go outside and see that nobody races a motor in the garage or does anything else that would be likely to tick up a lot of dust or jar any down from the celling."

(Continued on seat 146)



Send for this FREE book -TODAY!

This free book describes Mr. Murray's unique method of teaching in detail, and also includes a special test lesson from his famous course FREE. Just send the coupon (with 10c to cover cost of printing and mailing) and this interesting book with the free lesson will be forwarded at once

No, don't wait -you may forget -chp and mail this coupon NOW,

ARTHUR MURRAY Studio 889, 7 East 43rd Street, New York City

Arthur Murray, Studio 860 7 E. 43rd St., N. Y C.

7 E. 43rd St., N. Y C.
Please send me your 32-page book
and Special Test become I enclose 10c
to mover postage, printing and mailing

Name

Address

City

State

Arthur Murray's Famous At-Home Method

steps, the joyous modern steps that every-

jazz laughed its was an a the ballroom those awkward, old-fashinged steps—get rid of them

Learn to donce the new way and see what a dif-

ference it makes. Not only will you be more

popular, not only will you be a favorite partner,

not only will the gurls like to dance with you, but-

No longer will dencing be a ballroom duty, but a pleasure. At the end of a dance you won't feel

tured, but exhilarated. You can dance all night the

new way, and enjoy each dance more than the

You yourself will get more joy out of dancing

Those lumbering dances they used to do before

room maste

one is doing!

one before. It's great

You must know the latest?

Of course you want to dance the new way! Why don't you let Arthur Murray teach you—his fascinating, quick, at-home way—inthout partner, without music, in the privacy of your home? You'll get real pleasure out of it. Quicker than you'd magne possible, you'll fears how to do all the modern jazz steps that make a dancer popular.

To prove it Mr. Murray is willing to send his new illustrated book, "The Short Cut to Popularity," to anyone who requests it

YOU

YOU CAN BUILD THIS IDEAL WORK-BENCH—YOURSELF

THE pleasure of working with tools at home is greatly increased if you have a strong substantial beach with a good view. One that also has drawers and tool cabinets is a constant incentive to keep tools in order and give them the care and attention they deserve

A bineprint of the Home Workbench illustrated, with full size details and bill of materials may be obtained by sending 25 cents to —

POPULAR SCIENCE MONTHLY
150 FOURTH AVENUE NEW YORK

Howtolnvent

Edison Says Invention is a Science and should be taught as a profession

One Idea May Win You a Fortune

Thousands of Investions are needed today. Just one little idea can bring you fortune and fame. The wind is wasting for new power ins o engineering chemistry bruselink area irs. Jade.



and quer for la send well pay one no ney fur even he are that titled lattethings like for the but is cup the rimped har gen the cubber a the end of a pencil brought their favour of butte a of thousands

Undo Stynumake some all a so is an entire of Hoven to an elease that and be time into a matter of bred to k -If an European Dear Breite more mount in above to see the see the see of the see of the see of

It follows a definite course of moderate are no step from the negligible of a first of the first deal to ste final development on a commercial posts

earn at Home in Spare Time

Hithert every inventor had to work out these principles of devention for himself the every incomediate with the every incomediate with the principle and the every the king on WIAT TO INVEST and 100W IV INVEST. By now you can rea offer a few months what it the great strent in sense of discourage from an arrest to strong le to acquire. Fifteen fam as seven to have now revealed, for the first time the secreta if inversion. They explain how to or giante ideas he was develop and perfect your kiess, how to patent your inventions, and how to sell them to your best advantage. In there they make it do not please to you be been me an aventur, and by learning the while we aderf scheme of inventors step by their from beginning to end. It repairs not factorial or moments of your space time at builds.

First Course of Its Kind

This is the first course its practical Invention that has ever been devised. Now you can take Edison and store and actually learn 11000 TO INVENT how to make invention a protession! In simple rany-to-understand language, you are told how successful even its work a in learn how to give the secrets of invention that convert a samue male area Into mosey

EDEE New Book on Science hiventive

A wonderful new brok has just come from the promithat tells all atoms be belience of Invention, thus above have great haventary work, how fittle ideas have made furtises have you may can coully starts the expens of successful invention. This faction may beak will be write free to all have you may come there also mean never more distinct have your man, controlled the entrant of successful theoretics. This fact to me thank will be east from to all them who are generally interested. Send for the Bank tokay as only a limited manner are available for free that a man and a will be to the balk of the time. Write a surround and are available for free that a man and a wind a post of the polytest of the time of the control below or with a post care NOW! There is no cost of polytes don. below or pbilgation

BUREAU OF INVENTIVE SCIENCE Dept. 21, Wiener Building, Rechester, N. Y.

Bureau of Invent se Science. Dept. It Winner Building Rachester, N. Y Phase scaling our Investment, The Science of Invention.

| Nidde | | | |
|---------|----|--|--|
| Address | ** | | |

"State.

How to Paint Your Car

(Conditional from page 145)

"Why be so fussy?" said Jos. "What little dust you might get on the car by walking around won't hurt the varnish ABY "

"Don't you believe it," Gun stated decidedly. "That's why most amateur jobs look so punk. The least bit of dust on the varnush, and the bird who did the job has to tell all his friends that it looks fine if you stand 20 feet away!

"Just to be sure, I'm going to strain this varnush through a piece of that cotton cloth. Then, if there are any lumps or particles of grit in it, they won't have a chance to show up like warts on the flushed surface."

Jon followed Gus's instructions so literally that he made two customers shut off their motors at the door and pushed the care inside by hand.

The next morning Gua, with a great deal of pride, invited Joe in to see the result of his handiwork.

"HERE!" he said. "That's pretty I durn near as good a job as any professional auto painter could turn out."

"Sure looks swell," admitted Joe admiringly, as his eyes traveled over the smooth shining surface—no trace of dust

or a brush mark anywhere. "We ought to go into the auto painting business if you can do as good a job as that," he suggested. "By the way, I was looking over my flivver last night, and as far as I can see, the paint is perfectly good, only it's kind of dull. Could I freshen it up if I put a coat of finishing varnah on it?"

"If the paint isn't cracked or checked you can do a good job that way," replied Gus. "These quick drying auto enamels are pretty good for such a job, but you must be just as careful about dust as if you were trying to apply coach varnish. That's what most of the enamels are, anyway-high grade varnish with color added. Only be sure that you buy the best grade you can get; some of the cheap grades show white when the car gets rained on and they begin to look shabby before a month has gone by.

"Don't forget the beat, either. There was a fellow I know who put on a cost of one of these one-day-drying auto enamels in a cold garage in the middle of winter. It took nearly a week to dry and meanwhile dust blew in through the cracks in the door. That job looked like it had been done in a concrete factory

"And as for going into the painting business -- nothing doing! I'd rather pull down three transmissions and four rear ends than do one paint job. I'm an auto mechanic—not a painter

"This bus is finished now," be declared, as he started in to clean up his brushes. "We'll let it sit there for a couple of days and then I'm going to shower it down with cold water to set the surface of the varnish. Then I'll wipe it off with a piece of chamois skin and after that I'll roll down Main Street thinking I'm fooling everybody into believing that I have a new car!"

FOURTEEN

Hund-Picked

Petrtees mes who like E.ECTRICAL WORK will be given an approval opport unity. Must be over 18 years of age. Must first be employed in some legionate work. Must have bid 7th grade schooling. and be able to give at least two character references

Success to be Forced on Them

The Firstynial facial has beenly some wrote and and, the new of the rand chapter now taking times and the new discoveries being made, a front must be thirroughly trained in fundamental Electrical principles of the error in to be an ining man than a quanting bloomy in the Electrical field.

Con You Qualify?

The fourteen men selected will be trained at home in several most by the new practical job-method while still retaining their present postures. Their training will be planned to enable them to qualify fut a fixed posture and increased pay in the shortest possible time.

If you wish to share in this opportunity—If your wishings has not away bed places with your boats bear and if your boats have also if you bear and water and a property of a local solution, then write his immediately for full information.

------- MAIL THIS COUPON-----Chief Displacer Stanlage, Spt. (2744) 626 (C. 1886 St., Chipping

Please and me complete information about the gravajni g glacoga,

Number - Annancement of the Contract of the Co Ad4000...... ***** *************************



Your choice of a Violin. Tonor Banjo, Hawalian Gul-tar Banjo, Cornet, Ukulela, Banjo Ukulela, Gultar, Mandalin or Banjo Mandalin. You will be proud to two any one of these instruments and you can have one absolutely free. A few cents a day for lessons in your only expense. Our system of teaching is so many that you can play erveral pieces by note with the first four immore. We guarantee success or no charge. Instrument and leasure cout on one week's Free trial. Write for book let today, no obligation.

CHICADO CONTESPONDENCE SOUGH. OF MUSIC Brahard and Willow Circula, Bupt. 29, Chicago, Minch

SIGHS and SHOW-CARDS MADE LARY

You, tob, can paint attract, we stars and showcards with the sid of Leaver Patterial. Slingly space around the leaver pattern and 50 to. You will be actualisted how that kiy you can point a cital by this method. These per contact to to should either street board with contact of the show for rapid mattering. Each of shade contains all the leaves and the horacter is Board starms for board and charter in Board starms for brush and charter in the same starms for brush samples or better still order a few acts.

| ABC | ABC | ABC | ABC | ЯBÇ |
|-----|-----|-----|-----|-----|
| ABC | abC | 123 | 300 | abc |
| 123 | 123 | ABC | 123 | 123 |

Price Each Alphabet, I of in 50c, 2 in 60c J in 50c, 4 in 45c h in 31 50. Not, 2 14 and 15 Lower Case state order as follows: I in 50c, 1 to in 60c, 2 in 60c, 3 in 75c.

Price of feet of 10 Nonversit, 1 in 25c, 2 in 26c, 3 in 25c, 4 in 45c 6 in 70c. Order by Number and give size All reviews from this adver country, receive prompt attention and will be sept by paged post.

JOHN F. RAHN 2129 No. Neva Ave., Chicago, III-



Ea m 1979 to 2 200 a year Propage hunchis du me space from Alto narri maiste para banger. Nam sany specticul etse the it send at ence to tree book. Oppor-in Modern Chaingraphy" and full particulars.

Special offer apost onto NAL STUDIOS 125 THE BOOK, 1301 1001 Michigap Sec., 1301 Sec., U. S. A.

Is Your Memory Really Bad?

Continued from page 27)

who have remarkable memories for sport statuatics. They can tell you football scores and baseball batting averages without end. They don't learn these facts to show off, but simply pick them up because they are interested keenly in athletics.

When I went to Amberst, the president of the college was famed for his memory It was said that once he had met a student, he never forgot that student's name, no matter how many years intervened. The secret was profound attention. He made it a point to have a 15- or 20-minute interview with every freshman. I remember all the while I was in the office he was studying me closely First he made sure to get my name correctly. During the interview he used my name five or six times. As a result, at the end of the 16 minutes he had my name and had it linked to my personality

DO YOU find it hard to remember names? If you do, this repetition trick will help greatly. When some one Introduces you to Mr. White, say, "Oh, yes, Mr. White. I'm glad to meet you, Mr White. A relative of the Whites of Chicago? No? Mr. White, there, is a good friend of my father."

Punning on names helps, too; rememharing names by their resemblance to the names of animals, familiar objects, and so on; but don't try this with strangers right off the bat. If you can slip the name into a classification, that will help, too Some names sound aristocratic. Other names indicate immediately a certain nationality. Recalling that it was a name of frish origin would belp in bringing back the name of O'Brien. The name may be that of a color, such se Green or Gray, or you may think of other possible groupings.

Mechanical aids help in improving your memory in special lines. Make up little stories that link the facts together

Thus, in a comparative word-memory test, such as is shown on page 26, you are given a list of words in pairs, then later given one of each pair and asked to recall the other. The easiest way to remember these is to establish a story connection. Suppose the words are "dark" and "toe." "The man stubbed his toe in the dark." This little story serves to link the two words so that later you can recall them together.

VOU probably have not a few facts in I your mental storehouse that you recall by means of doggerel. You may, for example, remember the date of the discovery of America by using the old rhyme, "In fourteen hundred and ninetytwo, Columbus sailed the ocean blue." And no doubt you remember the months that have 80 days by the familiar, "Thirty days both September" jingle.

Such mechanical aids are useful-provided, of course, that they are not so complicated as to make remembering the method more difficult than remembering the facts themselves would be. While on the subject, I recall a shorthand version of the "Thirty days hath September"

(Continued on page 168)

FREE PROC



I don't care how large your waistline may be don't care what dista, muscle-straining exercises or harmful drugs you may have tried, without say of these only with this recourtable belt.

I Can Make You Inches Thinner—In 30 Days-Or No Cost

Off with that bulging wantline! With I usually desappear in 30 my new self-massaging, all-rubber reducing belt, I guarantee to give you an instant appearance of slimness and to permanenly remove your excess stomach fut carry presently and in an amazingly short time of il corta you dothing.

Lose Weight-Gain Health

My Scientific Reducine Belt poemter. on exactly the more or no de used by the expert mamour. It not only makes you look alim at once he with every

he we you make with every breath you take at gent's manager the loady blokem nall the such and the lat handles. From 4 to 6 inches (

days or less. Thousands of men wh-

Every Move Helps Take it OFF

dened with. CAL mid. Fat have acquired a normal wantline in this new, Pensing way

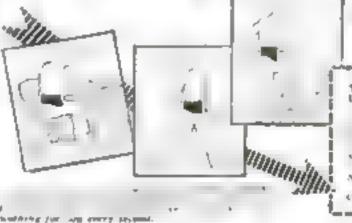
by physicians and with a calevery where bate as a rate management of your manney back

without a fund.

Don't Send a Cent

Mall the impact televier on all description is
a self-product I am give shall be at antique of a
entique to be defined to spent the attention of a
entique to be defined to spent the account apic

a for the Tiple WELL LONG ANY 10 full
rest, New Hayes Cong.



THE WEIL COMPANY, to: Hill Birest, New Heren, Conn. Frenchemen - Please med me, adularly outgathen, implete description of the Well brientine Reing Belt and also your figural 10 Day Trial Address

Make More Money

Read the Money Making Opportunities on pages 120 to 150 of this issue.

A BETTER JOB NOW-FOR YO

Earn \$2,000 to \$10,000 a Year!

Why work for small pay? Learn a good trade. Know autor-how to repair them bet a better job-Now! Or a business of your own. Learn in a few weeks here at the great auto-trade school in the heart of the auto-industry. of the repair work on explains in those card. There are not nearly enough tracted men to do this work. TRAINED Auto Man Are Wanted! You can be a skilled mes hance and auto electrician and Earn Big Money Experience not measure. If you are mechanically thekined come to Detroit now to the Old Retable "Michigan State."

earn Autos in Detroit

odo electricity, tractors. Straight Eight "with loug-Here you have wooderful advantages. Study actos, trucks, engines, acto electricity, tructura. All on best equipment up to-date. Many new care including Pa hard Straight Eight with lough wheel brakes. Butch Six (four wheel brakes), Oakland (four wheel brakes), new Otds. I No. Fludens many others. Hundreds of engines and electrical pertors to teach you, a thorough course that elights nothing, the plants of Ford Caddlar, Packard, Lincoln, Dodge. 動発を抑え 3 E P P on the standed of factory endorsed training at Detroit, the A Good Positions Open. Here a your chance to be indepen . The demand



most money. Michigan State Automobile School 281 Auchy Brailebry. Detroit, Michigan

GET THE FACTS - TODAY MICHICAN STATE ALTOMOBILE SCHOOL, 281 Auto Building, Detroit, Mich. Send me FRFE and without obligation complete infat-

macino about Detroit araining to btake the road money. NAMES - ASSESSED BASESSES OF

Street, or R. F. D.,

.. State. am interested to it kraident Course at your School.



Be a Dental Laboratory Expert! Let McCarrie Train You!

A. McCarrie, Director, McCarrie Behools of Mechan-

Don't crowd late the old overcrowded trades. Beof more to go int. bus ness You Don s

Chiongo, Detroit
and Cleveland.

The months is my big schools at Chicago, Detroit

Many McCarrie Graduates Earn \$65 to \$125 a Week!

70,000 bony Dentists MUST send their laboratory john to Experts, specialists in the making of plates, erosens, bridges etc. This business is at wiplates, erowns, bridges etc. The work is ear

men an

ear their business and we gain interrecting to may bug Field For the fell you all about the womenful papers on waiting for tained Dental Lauratury meh.

Rapid, Practical Training

I have uncressfully trained

Air county to

Company in section that are not not you mean or e. S. text.

Y splea on by singare di Dental Laboursey by opening the state of lauge

ply without entra charge. In-

dividual, personal instruction

t help you'

get a good job!

Level to be next the student

We mulnte a an efficient

ben ht pt is sente

with the abilities

week to con-

differ Mf a line

Usus service.

Way tist

ptre charge f r



"Earn nds four tiones larger " am astill with The Me us. duing all the work and mak ton man. My rare-

ton none by carri-blas are fou thron larger than before I en crest ach Thenk you for as writing no you for an inter-

Open a Laboratory of your own

Very little capitalisaesied Compression business have McCarrie training. raining. My includes tra nlog in Lab to Mory met mad Mid Dagean cut-

R. R. FARE to Chicago, Betroit or Cleveland

to every murlent who ils Act a y FRUE, because I have not raised the price of tultion a penay

since announcing this offer, I mite a me hiso I nin supplying every student with a complete moths of new tools and makes let Turban with the reach of the untrusted fellow who wants to get aboud. Easy terms.

Mail COUPON for FREE CATALOG and openial odera.

H. A. McCarrie, Director McCarrie Schools of Me-chanical Dentistry, 1338 So. Michigan Ave., Dept. 1492A, Chicago, III



When he was standarded

"Course intense After many to be weather the beautiful for many to be weather the beautiful for many to be a second to be a sec n. acquire.com

H. A. McCarrie, Director McCarrie Schools of Mechanical Puntistry 1338 S. Michigan Ave., Dept 1402A, Chicago

I want or know more about the Dental Laboratory business to the orbitals and property the sets of the years are the property of the property o

*** * ***********************

Caty Shalet assess acres

Is Your Memory Really Bad?

(Command from page 147)

sequence. It is the single word "appunseno," made up, as you can see, by combining the first letters of the names of each of the 30-day months in the order of their occurrence.

I know some persons who remember telephone numbers by making words of them. Each digit has a corresponding consonant. Between the consonants they fit vowels and make a word that is linked to the person's name. For instance, Mr Brown's telephone number is 5179. Euppose the consonants corresponding were g, b, l, and n. Think of the word goblin. A brown goblin—there you have it.

GOOD way of compiling the code that corresponds to the 10 digits is by selecting letters that resemble in some particular the numbers for which they stand. Thus I might equal one; a (two upright lines like the Roman numeral two; at (three lines) three; r (last letter of name of number) four; # (Roman numeral) five; p (resembles the number inverted) six; f (capital resembles the number) seven; ah (arbitrary choice) eight; # (written, resembles the number) nine; and a (first letter of name) sero.

Such a code has the additional advantage that the sounds are not repeated, and consequently any word formed from the letters will stand for one set of numbers and one only. By this system the number 1002 would become 1-a-a-n, suggreating the word "lesson"; the number 8640, sh-p-r-s, suggesting "shippers."

One man who makes many public speeches locates each successive "point" of his speech in a corner of the hall or in a room of his own house. Then when he has finished one point he looks in the next room and this instantly recalls the next point of his speech.

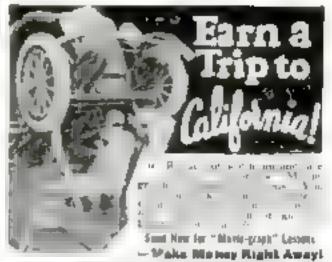
Last year there was a young Lathuanian at Columbia University who astoniahed every one with a remarkable memory demonstration. He could state correctly from memory the logarithms for figures from one to 100, and could call off any of 300 numbers previously arranged in a lust, when only their location in the list was indicated. It was understood that the young man had prepared for his exhibitions by memorizing the list. Even so, it was an impressive stunt

HE EXPLAINED that he did it by associating the numbers with various colors of the spectrum and that his powers were exclusively visual. He merely translated rolors that he saw back into numbera.

Supposing you have carefully organized the material that has gone into your brain. Your background of information, your ability to think of things in large units, your interest, attention, and repetition have helped to make vivid impressions. You have a healthy brain, so you let the process of retaining facts take care of itself. The only thing that remains is recalling the facts stored away

Thus, too, will take cure of staelf if you will remove all distracting elements, the chief of which is emotional disturbance fear that you will forget. I shall never

(Cantenned on page 149)



You can now begin at bases to earn your may to file Pay in any special work with a ch Nathabile estimated by the Mayin graph benefits before you You can start our mechanics? I want doubt made you You can start our mechanics? I want doubt made you it his former as mention if you can start our savel.

Some thinks at the and the made of the cannot be produced by the payon the form the course of the cannot be payed at the property in much a plear strongle way had you can instanticly makes been put to a conduction of the payed of the pay



DETAILED IN 1909

Hettenof Automotive Briegel Boos, 454-4664 Boom Pigneron St., 'Lee Angelee, Galli evidence for the the first Pear Monte-groupine, of Artisal Auto-topics of the first the first Pear Monte-groupine, of Artisal Auto-lines to the Conference on the Land and declary at home to be spin unpact.

A. Address of

Seal Rupture With a Quarter

PACT Marris provide on the absorbed grant notice of insigns satisfaction up to have grant it in the grant provide a special in the special provide a six of marris and the special provide a special in the special provide a special in the special provide a special p



Become More Efficient

Courses in Mathematics, Chemistry, Psychology Education, Business, and 40 other subjects command either 11 gh School or College Credit. Start say time.

Che Ministratty of Chicago 25 EPI- Hell CHICAGO, ILL,



WHITE THOMP WIR AMAZING OFFER Entire Course On TOTAL.

Complete business politics included formed for more descriptive Cook
at instances and Direct Act Quality

THE THEORY (CONOC). 123 Codego IIII. Springfield, Chin



Is Your Memory Really Bad?

Mones

(Continued from page 141)

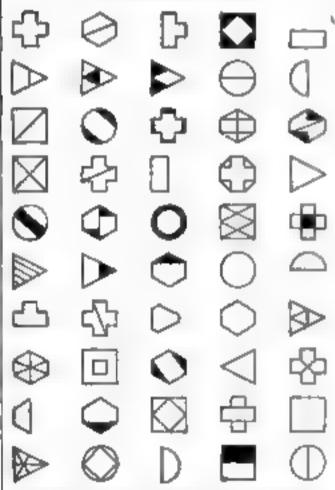
forget the appaling sensation I once experlenced on the platform in high school as I waited my turn to give a speech. I was sure I should forget. I did not forget, but the task would have been twice as easy if I had had confidence

If you can't remember something at first, drop the whole matter and come back to it later. It means that certain connections are established in your brain over the wrong paths. If you back off and rest a while, the wrong track will fade out.

Trust your memory and go right shead If the connections are established proporly, they will function with ease.

Memory tests concected in psychologists' laboratories have practical use right here. In themselves they do not improve memory, but they do develop self confidence. Try them on yourself. They will show you that there is nothing the matter with your memory. Your problem is to become a better manager.

The Picture Test



AMONG these 50 forms are hidden the 25 forms shown at the top of page 26. Check as many of the 25 as you can remember. Score one point for each that you remember correctly, and deduct one for each that you mark wrong.

The Word Test

OPPOSITE each of these 10 words write from memory the word with which it is paired on page 26. See how many you can recall.

Prefer Overcoat Tiger Freeze Fish Sickness Table Parlor Expensive Unfair



Cartoonists earn from \$50 to over \$250 a week! Why

don't you make big money in cartooning when new

method makes it so easy to learn—at home in spare time? PHOUSANDS who never dreamed they could make cartoons, can now carn big money in this lascinating field. Right at home in your spare time, you can now easily learn to make all kinds of cartoons—come, sport, political, human interest and animated. You can now earn some of the big money paid for cartoons of

every description. And cartooning dees pay enormous money. Briggs, Bud Fisher, Fontaine Fox, George Mc-Manua, Sid Smith and all the other head-liners curs more than the President. A single cartoon idea can easily mean a spleodid life-salary for you.

The World's Eastest, Pleasantest and Best Paying Profession

How could money be earned more pleasantly? A few hours a day at work that is as enjoyable uspay and there as al prost no bind to the money that can be earnest!

Never before have the opportunities in cartoon- ¿ ing been so many or so varied. Never has there been such a aplendid chance to

earn big money for cartoons. And regardless of what you are doing at present or how poorly you draw now, you can easily and quickly learn to make cartoons thru this new easy method.

New Easy Way to Loarn Cartocoing

It a fun learning to make cartoons this new way, It's just like a game. You learn at home, yet it is just as if an instructor stood at your elbow. You don't need to know a thing about cartooning You start with straight lines and curves. Then you learn the little secrets of origmating cartoon ideas, the methods of exaggeration, of action and expression—all the little tricks that make currooning amazingly easy to those who know them And soon you are making real carroons Many of our students had cartoons published before they were half thru their

When learning to make carroons is so easy, why shouldn't you too make big money and enjoy the fun of carrooning.

What Studente Say: P. H. - Househole Track \$120 a Booth Spore Time to the take that questioning in the comments of the production of the comments of the comments

Graduates of the school are to be found in every section of the country. Read in the panel what

they are doing and what they say about this training.

Mail Coupon for Free Book

Learn more about the wonderfus opportunities for making money in Cartooning and how this new method makes it easy for you to learn. Read about our students, how they make money while learning, and big salaries after they graduate Our hands mety. But after giver they graduate Our hands mety. But after the factoring and describes in detail this remarkable method of leaching Cartaoning. It will be sent to you we house objugate in. Mail the couper for time booklet more Warblington School of Cartooning, Room 341-D, 1112 13th St., N.W., Washington D. C.

WASHINGTON SCHOOL OF CARTOONING, Room 141 D. 1112-15th St., N. W., Washington, D. C.

Please and me without abbles are your Fee Rook let on Casterous and full done in my pour per cary both study six bod of traction Casterophy (FLEASS WA(TE PLASSELY.)

Nume

(State whether life Mine or Mrs.)

City . (3) under 16, please give age

\$100 in Cash Prizes

See Page 4 in front of book for details

\$1700 to \$3000 Year TRAVEL-See Your Country

MEN-WOMEN, 17 MP SMOULD MAIL COU

He Layella. Paid Vacations.



Francis, or Institute, Deep 6-378 Rechapter, N. V. Sire Send on without rharge (1 Speciment Radional Postal Clerk Ensulination questions, (2) PPEE took containing lim of V S government obstitute open to inch and wother; (5) Pros tample examination concline.

Name

Address

THE DANGER OF NERVE EXHAUSTION

Your Nerves can make or break you!

THERE is but one malady more terrible than Nerve Exhaustion and that is its kin, Insanity Only those who have passed through a siege of Nerve Exhaustion can understand the true meaning of this statement. The victim passes through the most son racking tortures he is in the grap of every concessa to fear

Nerve I vacation is the result of living under conditions of nerve strain. In men it can generally be traced to the strain of business worries and responsibilities, and, more frequently, to excesses, in women, to over-active emotions-particularly in mat-

tern of love and marital troubles. Indeed, we are ALL living under severe perye strain. We go about the husiness of bread-winning with a mad a tensity, and, in the same way, we go shout our pleasures. This is an age of nerve seriou and acone is strong even h to be immuse to its devastating effects.



PAUL YOU BY FURMANN Author of "News Fines and various other brudes on Hearth I so had as. Breathing Hygiene and hindred indirects.

Nerve Exhaustion does not come suddeny. It creeps in blee a thief in the night and you do not know it is there till you are actually in its clutches. When the first symptoms of this malady are upon you you pay little attention. It is not constitued unasual to expenence farigue, lamitude headaches, nervousness are other hymptonis. Yet sorely they will not stop there. Other stages of Nerve Exhaustion will follows alceptesaness, stritability, poor assimilation and digestion, constipation, irregular heart, etc.

If you have good nerves, keep them is by learnna with it to the life your netwest at a deranged build them up.

Do not wait until the final stages have developed and you are tald by your doctor to take a "long vacation" or confined to your doctor to take a "long vacation" or confined to your bed for mustbe of "rest" with drug at mulants and sedatives to keep you from "jumping out of your skin." The sime to act it when you are advised that "there is nothing the matter with you"—accept mereus and yet you KNOW THERE IS SOMETHES. THE MATTER.

Nerve Trouble or no serve trouble, you should have a knowledge of the functioning of your Nervous System.

Read "Nerve Force," a 64 page book on the care of the nerves. This book is a starting revelation to people with sensitive or deranged nerve. It has aided many thousands to gain control of their nerves and build up their Nerve Force. Price. 25c postpaid. (Coin or stamps.)

Address PAUL VON BOECKMANN 110 West 40th Street, Studio 161, New York City

Here Are Correct Answers to Questions on Page 41

- During the first six months. The increase in height is usually about five per cent a month. In weight it is about 20 per cent a month.
- They contain an oily chemical that evaporates, very irritating to the delicate membrane of the eye. The watering is an attempt of the eye to wash away the irritation.
- Precious atones are merely crystal-fixed minerals. They are formed in rocks by slow crystallization of the proper mineral
- 4. When the gun is fired, the powder turns into gas. The gas takes up much more room than the powder did and that is what drives the bullet out of the gun. When the bullet leaves the gun, the gas behind it escapes suddenly and sets up a sound wave. This is what we hour as the
- A broadcasting station does not send out merely a wave corresponding exactly to the sounds that it intends to broadcast. Instead, the fundamental thing that the broadcasting station sends out is a radio wave of uniform frequency, this frequency being the specified one for that station. This fundamental wave is called the "carrier wave." The sound message is superposed on it.
- The water inside the living cells freezes and this bursts the cells so that they die.
- It is made of nitroglycerine mixed with some absorbent material, as clay or sawdust. The atoms of nitroglycerine are fastened together very loosely. On the alightest provocation they fly apart and the n troglycerine explodes violently The clay or sawdust divides up the astrogiveering so that it is not quite so violent. I'm makes it safer to handle.
- When a cat is frightened or angry he ruffles up the bair of his body and tall in order that he may appear to be more dangerous. The cat does this by a chemical discharged by his advenal glands.
- 9. Strictly speaking, there is not; though at the center of the earth things would weigh very little. Weight is due to the attraction of gravity. At the center of the earth the attraction due to the matter of the earth would disappear, but there still would be some slight, weight due to the attraction of gravity of the mun, the moon and the other heavenly bodies.
- 10. Because when it was formed the matter that gathered together was revolving, probably because the attraction of the passing star started it off. The earth his simply kept on spinning as a top would spin if there were no friction of any kind to make it stop.
- A scorpion, not very different from modern ecorpions. In the Silurian period, four or five hundred multon years ago, there were a lot of scorpions living in the ocean. Some of them finally learned to Live ashore.
- 12. Very few people take exactly equal steps with their two legs. In ordinary walking we correct this automatically whenever necessary because we can see where we are going.

Fuscinating profession deteads more transact turn Steady with and twintinger leads to administrate Meet big allway officials. Travel or remain near hope We Secure Problem For For

prior graduation, paying a least \$10 per prior by prefund your bearing. You can prepare by 3 min he space time home study. Hundrade of Europeelni Graduates proportion see abred Bend to upon for all de sile.

Standard Sustances Training Inst., Buffalo, N. Y. Stead cast, entirely feer Panddet No. 2 84, giving all purpostage about course in Rullway Traffic Inspection.

-



THEN YOUR FALENT WITE MINEY

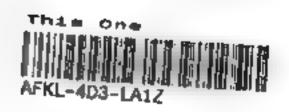
Cartinoniste surp from \$30 to \$300 per week word even none Remarkable tions of the Section of Distriction to the Course of Distriction of the best of the boundary of the best of the best of the Course plate of the Course THE NATIONAL SCHOOL OF CARTODHING





Getting Ahead?

Read the advertisements on Pages 120 to 150 of this issue if you want to get ahead!



Chortan The World's Largest Exclusive Radio Mail Order House Will Send You This

64 illustrated pages containing thousands of bargains in radio sets, semi-finished sets and radio kits of all styles, sizes and approved circuits. 5-tabe sets as low as \$29.50. Beautiful models of the very latest designs and types. Elaborate console models with load speakers. built right in cabinets of genuine mahogany and walnut. All sets guaranteed. Coast to coast reseiving range. Also contains everything in radio supplies, including batteries, chargers, loud speakers, transformers, condensers, rhecetate and any other parts you may want for improving your set or building a new one. Guaranteed saving to you of 1/4 to 1/4.

The Biggest 5-Tube Value on the Market

This set with all Assessaries, including the famous American full Load Epochs with adjustable unit, 2-45 volt "B" batteries, one guaranteed 100 Ampere Hour storage "A" battery, cable for battery enancetion, 3-201A tubes, Aerial and ground equipment, and everything complete ready to set up and operate.

Nothing cise to buy. Price.

Transportation charges extra. Shipping weight 100 lbs.

Order Direct From This Page! Save 14 to 14. Sets on this page are tyrical examples of bargains throughout our estalog. Our guarantee pro-tects you. Money cheerfully refunded if you are not estalated. Write your order and prious plainly. Bend post office money order or bank draft for full amount to insure easiety. Refer to any bank or commercial agency regarding our reliability.

Columbia Grand 5-Tube Console Set



Wonderful Book FREE!

Beautiful Walnut Calend in twoleped effect. Two drace pagers initial
with highest arade bent wateral.
Cabines in 29 Inches high. Top
measures 13x37 inches. Equipped
with high-grade built-in lood speaker
with adjustable with. Large, rowny
interior for builting all batteries,
books, etc. The Columbia Grand
is a 3-tube timed radio Descents
receiver. Coast 59 found received
range. Tune in statement descripvery amerities. Has interior type, lowless condensers, both and meckets,
inhelis has bookers, built and
in role on walout cales bakeine
mand. The twobuilt and wired—43x34.

Transportation charges extra. Ehipped by freight of exceess.

This set with all necessories, which inclinis 3-45 valt in butterian, code called an extra connection, arrival and ground equipment, inclining the set of the angle of the connection, arrival and ground equipment, inclining the set of the angle of the connection configuration configuration. Shipped by freight of express.

Transportation configuration. Shipped by freight of express.

Semi-Finished 6-Tube Super-Heterodyne



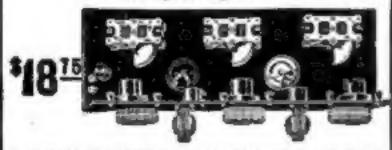
TUBE SET

World's Faceboard, Comes Completely assembled ready to wire and operate. We have testimonials from thousands of builders of this set. Some have received foreign stations on loop aerial. Unsurpassed in volume and tone quality. Low-loss straight line frequency condensers, vernier dials, finest quality rhousants. Matched Columbia long wave transformers. Requires only three acrews for attaching panel and baseboard and set is ready to wire and operate. 7x10 panel. Price of set only \$43.75.

Requires following accountries to complete this set; 7:20 cablest, i-384 tables for stor-age battery specialist or No. 136 tobes for dry cell squestion, 109 Ampere hour storage initiary, 2-67 "B" initiaries, loud speaker, senior tapped hop serial. All these trees are listed in our catalog, at a transcribunt saving.

Our nami-finished note come with all parts mounted on panel and baseboard ready for wiring. Do not full to send for our cotaing, flamenter—we are the largest entirely radio mail order dealers in the world and carry the heat of overything in radio. We says you 1-3 to 1-2 on everything in radio. Detailed descriptions appear in our entaing,

Femi-Finished 5-Tube Radio Frequency Set



This special offer is autounding the radio world. Coast to peast reception on loud speaker. Low-loss condensers and sockets. Highest quality transformers. Bakeine rheostatu.
All wiring concealed under Bakeine baseboard. 7x18 panel
—fits into any at antiard 7x18 cabinet. Complete instructions for operating. Guaranteed saving to you of \$50.00.

Price of set all mounted, \$18.75. Cabinet of same model as American Hadynole pictured above \$5.65 extra. prominent property and an investment of the control of the control

WLTRADYNE

Complete parts for 8-Tule Ultradyne receiver, without cabinet, complete with blueprint, instructions and diagrams

\$45.85

MEUTRODYNE

w155 0 tions bendy to wire

\$29.75

III.TRA-AUDION

One-tube Uhrs-Audi-Fully assembled and ready to wire, with, unstructions.

Gessian Liopand Non-Sitube Cockeday kit trodynakh of parts come of parts, fully assem-fully assembled so the bled on patel and Best 48 Kilocycle

Wigged of radio.

\$6.35

COCKADAY

\$15.85

EROWNING DRAKE

6-tube complete lowloss parts

\$32.40

REMLER 8-TUBE SUPER HETERODYNE

Super - Meterodyne Genuine Remier parts

\$49.50

FLANKNESS

2-tube reflex hit of parts, fully assembled on panel and baseboard, ready to wire, complete in-structions

\$16.95

Catalog Inchesor list of Sevent existing stations, paveral radio information and fasts about our free service ablaics. Write for it today.

RANDOLPH RADIO CORPORATION 159 N. Union Ave.

Dept. 223

Chicago, Illinois

OUR GUARANTEE Every article quantity as rup control. Every article is too

Now only It works better than a lot of sets that sell for twice the price. I have owned four other sets and heard many more - and none beats this one."





Demand Breaking All Records - More User-Agents Needed - Get Wholesale Prices Quick



COAST TO COAST RECEPTION VERIFIED BY SURRA

PRAISES THE PINE TONE AND

MONTANA MEANS BOTH COASTS bus took to O. K. Here not them, aw York in Lan Augebra, Wanning to Dallan Tallat, W. B.

Delies CLYS THE COAST TO COAST

CALIFORNIA THE PIRET MIGHT

COAST TO COAST PROM

With Mirror five take not on got-leng stations on the Pacific and At-sector courts. Yarhar E. . . . Pacif Valley, (Ritz.

BIGGINGAL CRYS START TO COAST

I am every piecess with the Elemen Ultra-5. Can get explices reconsense to event and from Francis of Special Cost, Co., . . . , Gurden, Minnigne,

LOTS OF VOLUME - 20 STATIONS FIRST MORE Will slone pag a few fines to let pag hours that I re-cale at me Shirmo Ultim-I and that it works fine. Bird To stations, the first capta — it has but of volume, Fred Vargating, Et.

The reports we print ere from UNBOLICITED letters

MONTANA MEARS CALIFORN

KFRA, On Petersony 18th of 27 Marsh Lance between open of transport of the day to the contract of the contract

WEST VIOCINIA SEASE AUSTRALIA

Goth-REWellington, Amstrolle, plants just night at 121-25 A M owner the Ulam & Mirror the Ulam & Mirror year and two I am designified and would not read for any south fact and southwarf to toward Gothe Feerle, Want Va.

Send coupon for

next up by pleased users.

The Powerful New

Guaranteed by One of the Oldest Radio Builders

MAHOGANY CABINET]

Tested and Approved by Radio's Highest Authorities

ULTRA SELECTIVE FIVE TUBE

You can either stream makes. lot of money on sets and sup-plies by sanding coupen inday for our Amazing Special Offer! It will setonish you. Big profits easy—accepting orders for Mirsen Sets. Only necessary to order one set to demonstrate in your home. No agreements to sign no sales-manship required. The per-formance of Miraco Suta dose the selling. Greatest demand in the six years we have been building sets -we need

in the opinion of radio ex-perts. Belectivity, long dis-tance reception, clarity of tone, power and volume have been amazingly increased— il' battery consumption is minimized—neciliations are easily controlled on all wavelengths, through use of latest radio inventions. Among these are: "Duoformers" (ultra lowkess inductance colls); the "Counter-Balancer" (patent-ed); flexible wiring which more user agents to supply it.

This latest improved 1925
model Miraco Ultra 5 - completely built, thoroughly and bear side of only two rheostats; a culpitately built, thoroughly and bear side of only two rheostats; a culpitately built, thoroughly and bear side of only two rheostats; a culpitately built, thoroughly and bear side of only two rheostats; a culpitately built, thoroughly and bear side of only two rheostats; a culpitately built, thoroughly and bear side of only two rheostats; a culpitately built, thoroughly and bear side of only two rheostats; a culpitately built, thoroughly and bear side of only two rheostats; a culpitately built and factory guaranteed by the Midwart Radio Corporation, one of board and other features of cultiest sets.

America's object, reliable and most successful Literature describes them fully. Send for it—and makers of quality sets—is an astoniching bargain Special Offer that will surprise and interest you. prevents broken or noisy con-



OtherMiracoLong Distance Sets \$

Wooderfully improved new models in one-tube and three-tube Miraco Long Distance Sets also ready at lower prices! New Miracoll-Entonly \$27.55 (retail) oper-

ates loud speaker on distant stations. New ene-tube Model R is also a record-breaker for distance at \$15.75, All Miraco ants work on storage or dry betteries, are easily connected and operated. Unmatched values Let testimony of users convince you. Write for





All the Proof you want is waiting for You!

Reports from house of some in every state power Miraco outs—at reak-bottom factory prices—
outpurform sets conting up to three times as much. Send for intest Biorestare, BYECIAL

(NYPERS and plenty of additional buttooing leaving so doubt that

Styres Radio Colo 'on Casat to Casat.

literature and Special Offer - use coupon.

MIDWEST RADIO CORPORATION Pioneer Builders of Sets

Clacknosti, Ohio Cincinnati, Ohio

Band free literature, AMAZING SPECIAL OFFER and all particulars regarding rough

Mr mount-saving proposition on Guaranteed Miraco Sets and all radio amplies,

D Aport D Unit D Denter.

MANE. ADDRESS

This seal on a radio or last advertisement signifies the approval of the INSTITUTE OF STANDARDS. See page 4.

Printed by Art Color Printing Co., Dunelles, N. J.



When a Finer Transformer Is Made It Will Bear This Name-Plate

Radio moves rapidly. Perhaps some time there may be seen a better transformer than what we now know as Rauland-Lyric. It may sell at \$9, or \$10, or \$15, or \$7. But the careful observer of the past year's developments will entertain not a moment's doubt of one thing: when the better transformer comes it will come beneath the famous Rauland-Lyric name-plate. Behind this as a pledge rests the entire organization and resources of the All-American Radio Corporation

Rauland-Lyric is easily obtainable from better-class dealers everywhere. The price is nine dollars. Descriptive circular with technical data may be had on request to All-American Radio Corporation, 4201 Belmont Avenue, Chicago



Rauland-Lyric tone quality is now available in a complete receiver: the new All-American Model R (a five-tube tuned-tadio-frequency set) now being shown. If your preferred dealer does not display it, send to us for descriptive booklet

Copyriganist ma

Shave every day-be comfortable

COLCATE'S

softens the beard at the base



YESTERDAY -

There are logical reasons for the disappearance of the whiskers that used to ripple o'er the bilateral conformations of the manly countenance.

When people invested money in buggies and tin bathtubs it was neither dangerous nor uncommon to display facial outcroppings; but this is an age of speed, and some things cannot conveniently be associated with velocity.

Proceeding at thirty miles an hour, a man with swishing side-whiskers might easily become involved in embarrassing entanglements. With his pilary encumbrances flapping like pennants in a storm, he would offer an immediate challenge to any motorcycle cop who might be inclined to pull him in.

There was a time when the proprietor of a rippling beard was justified in regarding it as a measure of self-defense; but that was when shaving was justly considered a major operation—when there was nothing

like Colgate's Rapid-Shave

Cream for making

lather. The



advantage of shaving every day becomes apparent when a picture of the man of affairs balanced between his former side-flaps is brought into contrast with the smart appearance he presents today.

Like millions of others, this man lathers with Colgate's because there is nothing that equals it for putting comfort into shaving. The moist, fine lather, goes to the base of the hair and softens it instantly where the razor's work is done.

There is no need of mussy rubbing in with the fingers. Working up the lather on the face with a wet brush is sufficient to make the heaviest beard yield easily to the blade.

Colgate's leaves the face cool and refreshed.

Let us send you a trial tube of this marvelous cream for better shaving. Please use the coupon and enclose 4c.

Colgale Co

COLGATE & CO., 72 St. Ambroles St., Montreal

COLGATE & CO.
Dept R
581 Fifth Ave., New York

Please send me the trial tobe of Colgate's Rapid Shave Cream for betree shaving. I enclose 4c. Jan

Name:

Address



Acourse inclicient lather, which falls to reach the base of the hair. Colgare's fine testure lather, which softens the half at the base.

Copyrighted House's

Truth in advertising implies honesty in manufacture